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NEWSPAPER

AT&T takes on the computer market

Unwraps five superminis, multiuser micro, local net, PC Interface

By John Dix
CW Staff

NEW YORK — AT&T made its long-expected entry into the computer industry last week with the commercial introduction of a family of Unix-based 32-bit processors that includes a multiuser microcomputer and five superminis.

Announced along with the 3B processor family at a press conference here last Tuesday were Ethernet-type local-area network interfaces and an interface that reportedly enables interaction between the Unix environment of the AT&T supermicro and micros that run under PC-DOS, the operating system for IBM's Personal Computer.

The 3B processors are not for everyone. Noting that they lack AT&T-supplied or supported applications software, Robert J. Casale, president of marketing and sales for AT&T Information Systems, Inc., said the processors' target markets are value-added resellers and large users that want to shoulder the responsibility for applications development and/or procurement.

Addressing the applications void, Casale pointed out that more than 90 companies market 300 commercially available Unix applications packages. However, it is unclear how many of the packages are compatible with the System V version of Unix bundled into all of the new AT&T processors.

In a nutshell, the products unveiled last week by AT&T include:

■ The 3B20 line of superminis, available in three configurations: the single-processor 3B20S, the attached processor 3B20A and the dual-processor 3B20D. The systems range in price from $230,000 to $340,000. *Story on page 8.*

■ The 3B5 mid-range superminis, which are said to be optimized for Unix and range in price from $67,000 to $73,000. The two models in the 3B5 line, the 3B5/100 and 3B5/200, are based on AT&T Technology Systems Group's 32-bit WE 32000 microprocessor, developed by AT&T's Bell Laboratories, and use 256K-byte random-access memory chips. *Story on page 8.*

■ The 3B2/300, a $9,950 multiuser microcomputer that is also based on the WE 32000. The 3B2/300 uses 256K-byte RAM chips, has a 10M-byte Winchester disk and can reportedly support up to 18 users. *Story on page 9.*

■ Two Ethernet-compatible local-area network interfaces. One is a three-board AT&T set for the 3B20 and 3B5 superminis that uses a WE 32000 and costs $7,000. The second is a $3,000, single-board interface that uses an Intel Corp./Seeq Technologies, Inc. chip set for the 3B2/300. *Story on page 9.*

■ The hardware/software PC Interface. The PC Interface enables the 3B2/300 to act as a host in a star network of IBM Personal Computers and compatible microcomputers running under PC-DOS, IBM's version of Microsoft, Inc.'s MS-DOS operating system; allows files to be transferred between machines using PC-DOS and those running Unix; enables the micros to act as Unix terminals; and allows the micros to communicate with each other. The price of the PC Interface will not be announced until the third quarter, when the product will be available for shipment, according to AT&T.

While together these products represent what Casale claimed is the broadest range of initial product offerings ever made by a

See AT&T page 8

Wang brings out top-of-the-line supermini

By Tom Henkel
CW Staff

LOWELL, Mass. — Wang Laboratories, Inc. last week announced its largest processor to date, an addition to its VS line of 32-bit superminicomputers that is said to offer users three times the internal performance of the former top-of-the-line VS 100.

The VS 300 is compatible with systems software and application programs developed on Wang's VS 25, VS 45, VS 85, VS 90 and VS 100 systems.

The new supermini features a pipelined central processor that reportedly can perform three functions at one time. In one 120-nsec cycle, Wang claimed, the CPU can simultaneously execute an instruction, decode a second instruction and fetch a third instruction.

Industry watchers had expected the announcement of the VS 300 for some time. Craig Symons, a financial analyst with Gartner Group, Inc. of Stamford, Conn., explained last week that Wang needed a high-end processor to compete with similar systems offered by its competitors, such as Data General Corp.'s MV/10000 and Prime Computer, Inc.'s 9950. It also needed a powerful supermini that could be used as a vehicle for connecting corporate microcomputers, Symons added, observing that the VS 300 appears to offer the potential for such applications.

The VS 300 features 4M to 16M bytes of main memory and a 32K-byte cache memory. A dedicated, buffered Memory Control Unit relieves the processor and I/O subsystem from the task of managing memory requests, the vendor said.

The system can execute up to 255 concurrent user tasks; up to 192 workstations and printers can be attached to it. The VS 300 uses an enhanced version of Wang's VS operating system that is compatible with existing word processing, DP and communications software, according to a

See WANG page 10

TOP OF THE NEWS

AT&T and Wang Laboratories, Inc. rang up with the major hardware news last week, but National Advanced Systems, Inc. was also on the line. It answered IBM's 3080 X series announcements with price cuts and memory expansions for its high-end AS/9000 mainframes. Page 3. Sperry Corp., meanwhile, said it will be holding a press conference today to introduce what it refers to as the industry's first fourth-generation language micros for stand-alone use or mainframe connection. Page 4.

■

Ashton-Tate was among the software vendors that called in major announcements last week. Its introduction of an integrated microcomputer software package called Framework pits the company directly against Lotus Development Corp. Page 8. In addition, Data General Corp. brought out what it claimed is the first large-scale financial management package integrated with an office automation system. Page 5. Artificial Intelligence Corp. introduced two versions of Intellect that provide an interface to IBM's SQL/DS. Page 10.

■

How long will your data communications bills stay the same? Maybe until June 13. Maybe not. There's been a lot of action at the Federal Communications Commission lately. Page 4.

■

For large users, the office automation marketplace is maturing more rapidly than expected, a major survey reported last week. Page 6.

■

The Department of Defense has been empowered to review export licenses for computers and other high-technology items to noncommunist countries suspected of being shipment points to Eastern bloc nations. Page 14.

We apologize if your *Computerworld* arrived late this week. The blizzard that hit the East Coast last Thursday knocked out the lines supplying CW's Framingham, Mass., offices with power, bringing down the text editing system used to create and typeset the newspaper. As a result, production of the paper was delayed for one day.

NEWS

AS/9000 prices cut, memory hiked

By Jeffry Beeler
CW West Coast Bureau

MOUNTAIN VIEW, Calif. — National Advanced Systems Corp. (NAS) last week trimmed the prices of two of its AS/9000 series mainframes by 8% and 10% and expanded the machines' main memory by 16M bytes. Similar expansions of internal storage were also announced for two other members of the NAS 9000 family of IBM-compatible processors.

In a related move, NAS cut the 9000 line's maintenance prices by 5% to 27%.

Together, the main memory enhancements and the cuts in both purchase prices and maintenance expenses constitute the first stage of NAS' reply to IBM's recent 3080 X family upgrade [CW, Feb. 27]. The second phase of that response is expected to come early next month with the expansion of NAS' 8000 family of IBM-compatible CPUs, industry sources said.

NAS last week also disclosed its revised timetable for testing and delivering IBM's Extended Architecture (XA) for the 9000 series. Testing of XA will start this year during the second quarter both here and in Japan, with shipments of XA upgrade kits scheduled to begin reaching 9000 series users during the third quarter.

Originally, NAS had intended to start making XA available to users of the 9000 family during the second quarter of this year. But snags in IBM's own XA shipment schedule forced NAS to delay its delivery dates by one quarter, according to Mitch Schoch, director of NAS' North American systems marketing.

XA is also slated to be added to one of the 9000 family's sister products, NAS' AS/8000 mainframe line, which made its debut last year. In fact, 8000 series users will begin to receive their XA opgrade kits during the fourth quarter, Schoch said.

NAS' latest mainframe pricing moves apply both to the company's 9060 and 9080 processors, whose purchase prices the vendor has pared by 10% and 8%, respectively. As a result, a basic 9060 now sells for $2.7 million, compared with $4.5 million for a comparably configured 9080.

As part of the same announcement last week, NAS expanded from 48M to 64M bytes the main memory capacity of both the 9060 and 9070. The enhancement has left the two machines equal in internal storage to the 9000 family's top-of-the-line member, the 9080, whose maximum capacity of 64M bytes remains unchanged.

Elsewhere in the 9000 series, NAS boosted from 32M to 48M bytes the main memory of the product line's two low-end models, the 9040 and 9050.

In yet another announcement, the vendor trimmed the 9000 series' maintenance prices by 14.6% for the 9040, 14.7% for the 9050, 17.7% for the 9060, 15% for the 9070 and 26.6% for the 9080. Each of these price cuts refers only to the five models' basic configurations, Schoch noted. The exact amount of the maintenance price cuts varies with the machines' main memory and channel capacities.

In any event, the change in NAS' pricing structure has cut the monthly maintenance charges for the 9000's five minimum configurations to $4,821 for the 9040, $5,724 for the 9050, $6,662 for the 9060, $8,790 for the 9070 and $10,437 for the 9080.

NAS' announcement of price cuts and memory enhancements comes only about a month after IBM's announcement of six additions to its 3080 X family of large-scale processors. Introduced during the week of Feb. 20, the six machines reportedly provide 5% to 14% greater performance than the 3083, 3081 and 3084 models they replace.

Both the price reductions and memory enhancements for the 9000 family machines take effect immediately, according to NAS, which is based at 800 E. Middlefield Road, Mountain View, Calif. 94042.

Reaction to 3480: It may not replace 3420

By James Connolly
CW Staff

Possible savings in time, space and energy sparked IBM users' interest in the long-awaited IBM 3480 tape drive, but that interest doesn't ensure that the cartridge system will replace IBM 3420-type drives in a year, seven years or ever, users and industry observers indicated in interviews last week.

"Anything that saves us space, power and cooling is interesting. Anything that increases the speed with which 3380 [disk drives] can be dumped is interesting. But the change in media means we have to be careful about jumping in too fast," said Laura Gregory, vice-president for technical management at Bank of America in San Francisco.

Moreover, she added, "From what I've seen, it doesn't look like the price comparison is going to be as favorable as we would like."

Richard Wagner, manager of technical services, operations and communications for the Lycoming Division of Avco, Inc. in Stratford, Conn., said his initial reaction "is that finally, after all we have been hearing, the announcement has been made."

"We are definitely interested in the speed of the new system," Wagner said. "The other thing of interest to us is the footprint. Like other people, we are interested in getting more square footage in the machine room. Every square foot that we save puts off the time that we go to the company and ask to expand."

Gregory, Wagner, other users and consultants commented on the 3480 in the days following IBM's March 22 announcement that the high-end tape system will be available in early 1985 to replace the 11-year-old 3420 drives [CW, March 26].

The 3480 features a 3M byte/sec data transfer rate, which more than doubles the 1.25M byte/sec rate of the 3420, and the use of 18 recording tracks on the ½-in. chromium dioxide tape, resulting in a sixfold recording density increase, from 6,250 to 38K byte/in. Utilizing a 4- by 5-in. cartridge rather than a 10½-in. reel, the 3480 was designed to save tape storage space and to use 60% less computer room space than the 3420.

The 3480's Data Facility Hierarchical Storage Manager, Version 2, relieves the host computer of the job of transferring data from disk to tape and allows the computer to just instruct the disk to unload data. That feature is intended to free the host for other tasks.

After examining the 3480's specs, Tom Baker, second vice-president for data processing at Guardian Life Insurance in New York, said, "With the advent of the high-capacity disk and the large data center, it takes a lot of time to back up a 3380. Even though we only back up data that was altered during the day, we think that perhaps it could save us a couple of hours a night."

However, the surveyed users, who run IBM 3081 and 3083 mainframes as well as other systems, said they still wanted to learn more about the 3480s before committing to buy any of them.

At an IBM users group meeting in Atlanta at the time of the announcement, consultant Hugh R. Green, director of IBM large market services for The Gartner Group in Stamford, Conn., said some attendees saw the tape being used in a start/stop role, rather than a data stream role. He noted the product can only reach its full potential in a data stream role, particularly for organizations with large archival operations.

But Green also noted that the scheduled first quarter of 1985 delivery date "is not the strongest indicator" that the product will be readily available to buyers. Green expects the 3480 announcement to force IBM competitors, particularly Storage Technology Corp., to offer cartridge systems even if they have reel-to-reel devices that can match some of the 3480's performance figures.

An observer of the tape market, Don Collier, general manager of the "Freeman Reports" in Santa Barbara, Calif., observed that the 3480's introduction "certainly ensures a healthy future for magnetic tape and rejuvenates the high-end tape market in particular." He said the tape, thin-film heads and cartridge design "will break loose the logjam" that has held back OEMs and plug-compatible manufacturers who have awaited the IBM announcement before releasing their own tape systems.

However, he noted that 3420-type systems "will be around for many years to come" because it is too expensive for large users to transfer their "500,000 reels of tape" to cartridges. He predicted that the gradual transition to the newer product will start with buyers of new systems using 3480s and with established shops buying 3480s for use with new applications and using 3420s with existing applications.

Collier sees the 3480's strong points as its 60% cut in space and power requirements and twentyfold increase in data integrity.

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NEWS

Sperry to offer 'fourth-generation-language micros'

NEW YORK — Sperry Corp. Computer Systems today is expected to introduce here what it termed the industry's first fourth-generation-language microcomputers for either stand-alone use or mainframe connection.

Sperry's Mapper 5 and Mapper 6 microprocessors, the first of a new line of desktop microcomputers, bring the company's Mapper mainframe application development software down to the chip level, said Dewaine Osman, vice-president of the company's Americas Division. Osman said the starting price for the multiuser system is under $40,000. More detailed information was not available at press time.

As stand-alone desktop systems, the Mapper microprocessors become "personal data processing departments" for middle managers and administrative people, Sperry said. They feature color graphics, message sending and related office functions, searches, sorts, merges and arithmetic computations.

The Mapper 5 was designed for Sperry environments and links to Sperry mainframes. The Mapper 6, available for "a slight increase in cost," offers the additional ability to link with IBM mainframes, a spokesman said.

Mainframe-based Mapper data can be updated and shared downline at the workstation level, extracted for local use or executed by remote command, Sperry said. The systems can support up to 16 Sperry UTS display stations or the Sperry Personal Computer, the firm said.

The systems' basic configuration is said to feature an 8-MHz Motorola, Inc. 68000 microprocessor with a discrete virtual memory management unit for virtual address translation. Up to 30 processes are supported, each with a maximum private virtual address space of 4M bytes, Sperry said.

The cabinet housing the processor also houses a 5¼-in., 655K-byte floppy disk drive, a peripheral interface for Mapper mass storage and backup subsystems, an asynchronous port, three dual RS-232 synchronous ports to handle UTS terminals and the Sperry Personal Computer and three more RS-232 synchronous ports to support micro-to-micro and micro-to-mainframe communications.

A mass storage and backup subsystem consists of a fixed disk controller, a 28.5M-byte fixed disk drive, a 45M-byte streaming tape unit or two fixed drives with a total of 57M bytes of storage.

Sperry Computer Systems can be reached through P.O. Box 500, Blue Bell, Pa. 19424.

Private-line, dial-up rates to rise June 13 — or April 3

By Phil Hirsch
CW Washington Bureau

WASHINGTON, D.C. — How long data communications users will continue to pay current dial-up and private-line rates was a key questioo here last week.

The Federal Communications Commission last week ordered AT&T and the nation's local telephone companies to continue until June 13 their present division of revenue contracts, which govern the rates now being paid by the nation's communications users. Without FCC action, the contracts would have expired tomorrow, April 3.

However, Bell Atlantic — one of the seven regional telephone holding companies created by AT&T's divestiture of its operating companies — last week asked U.S. District Court Judge Harold H. Greene to cancel the contracts tomorrow.

If Greene complies with that request, tariffs that incorporate the FCC's new access charge plan would go into effect immediately. Those tariffs charge sharply higher rates for most dial-up and private-line services.

Bell Atlantic contends that continuing the division of revenue contracts is illegal because the decree settling the U.S. vs. AT&T antitrust case against AT&T said, "tariffed access charges shall be the exclusive means for the former Bell telephone companies to receive compensation for exchange access service following divestiture."

Greene, who presided at the U.S. vs. AT&T trial and is now overseeing the settlement, agreed late last year to defer this provision for three months — from Jan. 1, the date on which divestiture officially took place, to April 3 — to give the FCC more time to analyze the access charge-based tariffs that had been submitted by AT&T and the local telephone companies. But at the time Greene granted this delay, he said he was assuming that "the arrangement between AT&T and the operating companies ... will expire in April 1984."

Last week, Larry Povich, an FCC policy spokesman, said that under the commission's rules, the pending tariffs can be deferred until June 13. "Judge Greene has absolutely no jurisdiction in this area," he added.

According to Bell Atlantic, the commission delayed the new exchange access tariffs not for the stated reason — that they weren't sufficiently cost-justified — but "as an accommodation to AT&T's alleged financial condition," refering to an emergency petition filed Feb. 27 by AT&T that requested delay of the new access charge plan and, hence, of the pending tariffs.

AT&T's major concern is that the latest revision of that plan, which defers the residential and single-line user surcharge and revises the fees which competing other common carriers must pay for local exchange access, will increase its costs drastically and result in a substantial revenue loss.

AT&T wants the commission to raise the other common carriers' access charges and lower the former Bell operating companies' authorized rate of return. That rate currently is 12.75%. AT&T proposed a return of 11% to 12%.

If the commission accepts the phone company's proposal, AT&T said it would lower its own rate to the same level authorized for the former Bell operating companies, even if this requires reducing present rates.

In last week's order, the commission announced that it would investigate the need for changing the 12.75% rate of return.

AT&T to drop Accunet Packet Service prices, offer lower speed

By Bryan Wilkins
CW Washington Bureau

WASHINGTON, D.C. — AT&T Communications has filed a tariff to decrease prices as well as offer a lower transmission speed option for its Accunet Packet Service. The changes will become effective May 5 if they are approved by the Federal Communications Commission.

Accunet is currently available at 9,600 and 56K bit/sec. AT&T's request for 4,800 bit/sec service marks the first time the carrier will offer this transmission speed option for data transmission. AT&T hopes this will make packet-switching more attractive to businesses that do not require high-speed transmission rates.

Accunet Packet Service, initially offered last June as the Basic Packet Switching Service, has not met with great customer demand, AT&T Information Systems, Inc. officials admitted. They are trying to expand its attraction by tailoring it to specific market segments, such as insurance firms and the automotive industry.

The newly filed tariffs for Accunet Packet Service reflect monthly charges as well as per-packet charges, AT&T Communications said. For instance, the monthly port charge for 56K bit/sec transmission would drop to $950 from the current rate of $1,200. The monthly port charge for 9,600 bit/sec service would be $550, down from the current $850. The proposed 4,800 bit/sec service would cost $420/mo.

Under the new tariff, filed March 23, the kilopacket rate for every 1,000 packets would be 75 cents instead of $1.35. This rate covers the first 4,000 kilopackets transmitted during normal business hours; the second 4,000 kilopackets would cost 70 cents per kilopacket, and the third set of kilopackets would cost 65 cents per kilopacket. Every kilopacket beyond 12,000 would cost 60 cents.

Transmission rates during non-business hours would be a uniform 30 cents per kilopacket.

A new feature of the service proposed in the tariffs would permit customers to share trunk lines accessing one of the three existing packet-switch nodes already made by AT&T.

AT&T Communications said that the sharing of trunk lines will permit as many as 1,000 data terminals to be addressed on a single access line and up to 511 different messages to be transmitted simultaneously over one access line.

An access line connecting an Accunet Packet Service customer to the AT&T packet switch, as well as the equipment needed to convert terminal data into packets for transmission and deconversion at the receiving end, will have to be obtained by the customer.

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Ashton-Tate pits package against Lotus 'Symphony'

By David Myers
CW New York Bureau

NEW YORK — Ashton-Tate last week marched into the integrated applications software arena to battle Lotus Development Corp., signaling the start of a clash between two microcomputer software titans.

At a news conference here, Ashton-Tate unveiled a software package integrating spreadsheet, word processing, graphics and data base capabilities with an "outline," or "electronic table of contents," utility for organizing manuscripts made up of text, graphs and columnar charts.

The package, called Framework for its use of "frames," or windows, is expected to go head to head against Lotus' recently announced Symphony product [CW, Feb. 20]. Framework, which requires 256K bytes of random-access memory and two disk drives, will sell for $695, the same price as Symphony, and is expected to be available on the same date, July 2.

David Cole, Ashton-Tate's president, said Framework will initially be available on the IBM Personal Computer and compatible machines, but may be adapted for other hardware manufacturers.

Robert Carr, Framework's product manager, said the package can manage 3,000 10-item data base records, 200 pages of text and 20,000 spreadsheet entries. It can also access the operating system through one window.

Although the Ashton-Tate product does not include Symphony's communications capability, data from the package can be transmitted over phone lines via the operating system window, Carr said. Framework can be coupled with Ashton-Tate's Dbase II software as well as Lotus' Lotus 1-2-3 package and other Ascii files.

The word processing part of the package was described as similar to Microsoft, Inc.'s Word.

Framework also comes with a 140-function programming language, which Carr described as "Basic- or Pascal-like." Even so, Ashton-Tate said Framework is aimed at first-time users.

While the initial reaction to Framework was enthusiastic, it was muted by what many perceived as massive marketing obstacles confronting Ashton-Tate. "It seems Lotus already has the IBM market pretty much sewn up," said Michael Killen, president of San Jose, Calif.-based Strategic, Inc. "I would not want to go head to head with those guys right now."

Ashton-Tate is headquartered at 10150 W. Jefferson Blvd., Culver City, Calif. 90230.

DG gives CEO finance support

WESTBORO, Mass. — Data General Corp. last week introduced what it described as the first large-scale financial management software package integrated with an office automation system.

DG's Comprehensive Financial Operations (CFO) package provides real-time control over finances in an organization while supporting distributed accounting functions in multiple remote locations. CFO is compatible with DG's Comprehensive Electronic Office (CEO) system, which runs on DG's 32-bit Eclipse MV series superminicomputers under AOS/VS.

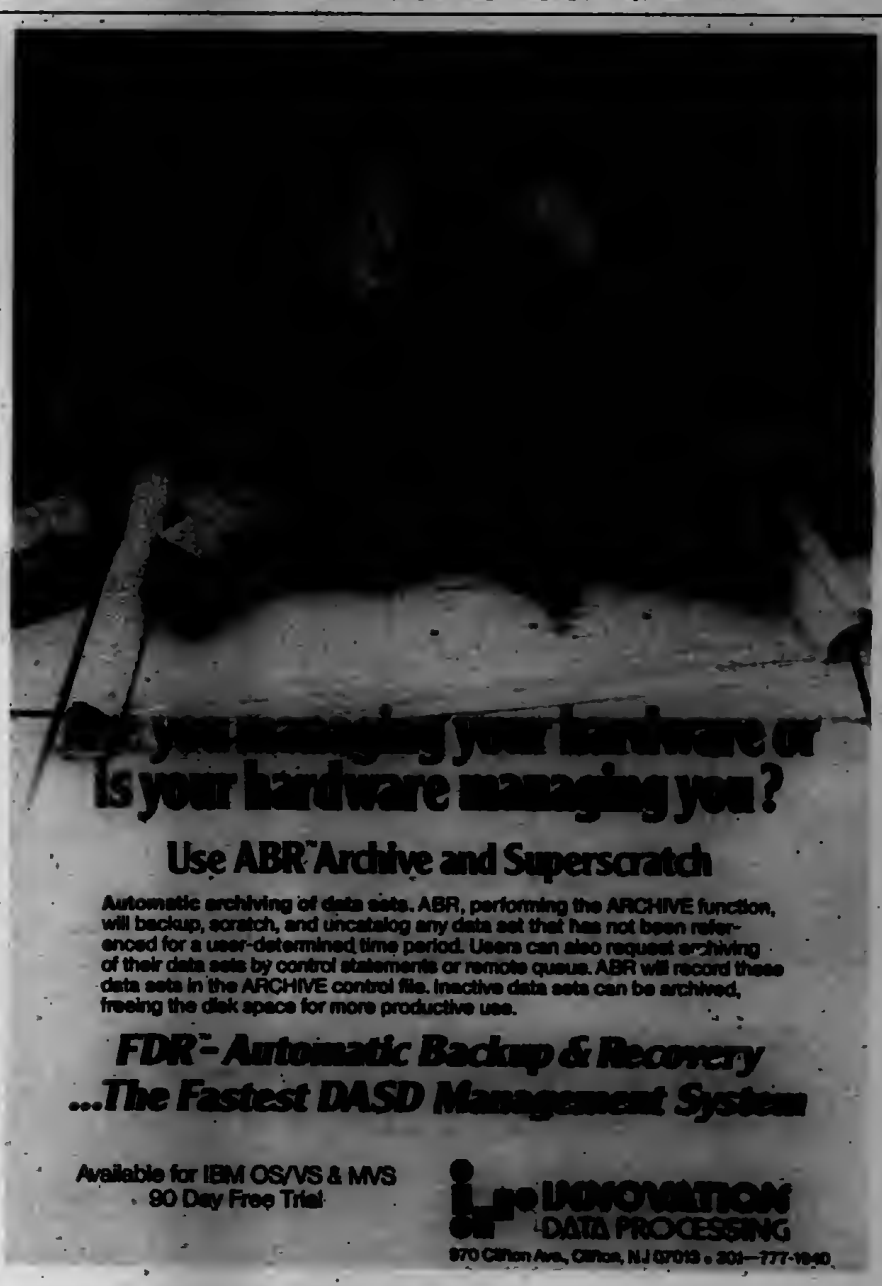
CFO consists of five modules that can be utilized separately or together. The modules — general ledger and financial control ($48,000), accounts payable ($34,000), purchase order ($38,500), materials management ($32,500) and accounts receivable and credit management ($48,000) — are said to share files interactively.

The CEO office automation system consists of CEO Word Processing; CEO Information Management, including electronic mail, filing and administrative support capabilities; and CEO Decision Support. Both CEO and CFO utilize DG's Infos II file management software.

A spokeswoman said CFO incorporates a layered design that keeps hardware and system software functioning separately from the accounting modules.

Six "personalizers" integrated with the five modules allow users to create, maintain and enhance the standard financial applications. The personalizers include a screen builder that enables users to custom-design system screens; a report builder for user-definition of report parameters; an inquirer feature that is said to provide real-time, interactive display of system information; a validator that allows users to define valid data entering the system; a documenter that ensures that essential documentation stays in real-time synchronization; and a table manager that allows users to update any table or data base used by CFO.

DG's Information Systems Division is located at 4400 Computer Drive, Westboro, Mass. 01581.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User survey: OA more mature than expected

By John Gallant
CW Staff

NEW YORK — Nearly 60% of the nation's largest corporations already have strategic policies governing the acquisition and use of office automation equipment, and that number is expected to rise to almost 85% by 1985, according to a survey released here last week.

The survey — *The Office Automation Challenge: American Business Responds* — combined responses from individuals responsible for planning and purchasing office systems within 834 U.S. businesses, including nearly half the Fortune 500 Industrial and Fortune 500 Service corporations. The study revealed an OA marketplace maturing more rapidly than expected, according to its sponsor, The Omni Group Ltd.

A significantly lower number of small and medium-size companies — firms with fewer than 100 workers — currently have strategic OA policies, the study found. However, it predicted a dramatic increase in that number by 1985, when over 55% of the small and medium-size firms are expected to have OA policies in place.

"Clearly, the most important finding of this survey is that the office automation marketplace is as mature as it is," said Randy J. Goldfield, president of The Omni Group. "Many people believe that OA is a new frontier, but that isn't the case. The study revealed that an area once handled by the office manager or the purchasing department is becoming more professionalized and specialized."

The task of developing OA policies falls on different shoulders based on company size, the survey showed. Among the Fortune 500 group, interdepartmental committees and individual departments with OA responsibility were most commonly drafted as policymakers. Company presidents and office managers often bore the yoke of decision-making within the smaller firms, and, in all but a few organizations, the users of office systems were rarely a factor in policy formation.

But while they may not be a critical component of the policy-making process, users can at least rest easier about keeping their jobs in the face of growing office automation. Staff reduction is the least important factor in the acquisition of OA equipment regardless of company size, the survey indicated. Increased processing speed, reduced transaction costs and equipment compatibility carried significantly more weight in office systems decisions among the corporations surveyed.

Nonetheless, personnel concerns remain a factor in the growth of OA. The survey showed that 72% of the Fortune 500 firms see the avoidance of staff increases as an important factor in purchasing office systems.

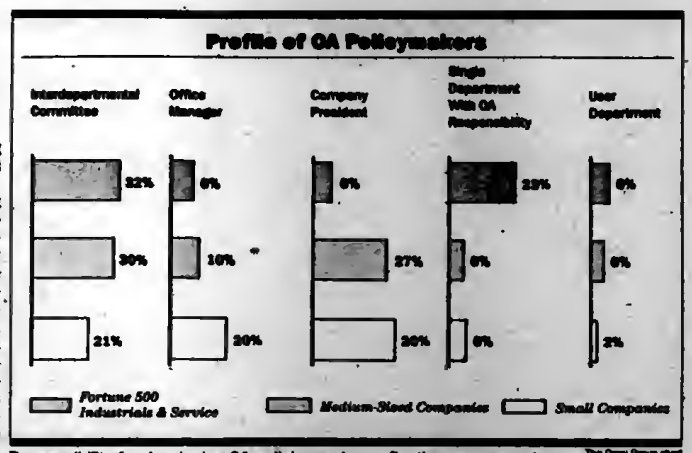
The importance of minimizing staff increases is borne out for small and medium-size companies also, with the survey indicating figures for that group similar to those for the larger organizations (63% and 61%, respectively).

Where are U.S. firms buying the word processors and microcomputers that make up their office systems? Purchasing directly from the manufacturer is the preferred route for word processing equipment, especially among the larger firms. And, although the figures are smaller, direct purchases of micros outweigh retail sales by a two-to-one margin, according to the study.

Respondents listed service, discounts, training and help in long-range planning as the major benefits of dealing directly with the manufacturer.

"The strong preference to buy direct indicates corporations want more than they think retail stores can provide," Goldfield said. Conducted in late 1983, the survey was underwritten by 12 information technology and service companies, including AT&T Information Systems, Inc.; Exxon Office Systems Co.; Hewlett-Packard Co.; Lanier Business Products, Inc.; Syntrex, Inc.; Tymshare, Inc.; Xerox Corp.; Datapoint Corp.; and Philips Information Systems, Inc.

Copies of the survey summary can be obtained free from The Omni Group, 115 E. 57th St., New York, N.Y. 10022.



Responsibility for developing OA policies varies, reflecting company size. The Omni Group chart

Some of most touted OA applications not catching on

NEW YORK — Some of the most highly touted office automation applications have yet to be embraced by corporate users, according to a survey released here last week by The Omni Group Ltd.

The survey indicates, for example, that electronic communications is seen as a key application of office systems by less than one-fifth of the nation's largest corporations, and the figure dips below the 10% level for small and medium-size firms. Similarly, graphics applications were mentioned as an important OA application only infrequently across companies of all sizes.

Data analysis, including the use of spreadsheets, projection and modeling packages, is by far the most important application of office systems among managers and professionals, the survey found. Among support staff, word processing is the most important OA function. Data processing, including transaction processing tasks such as order entry and inventory control, ranked as the second most important application across both types of workers.

One of the most important findings in this area, according to Dr. Warren Waldbrand, director of research for The Omni Group, is that data processing applications — though still ranked second — were seen as a more important use of office systems among small and medium-size U.S. corporations compared with their larger counterparts.

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Boom in local nets expected

NEW YORK — Local-area networks will "proliferate substantially in major market segments" over the next two years, becoming the "most volatile area" of the office automation marketplace.

That is one of the findings of *The Office Automation Challenge: American Business Responds* survey released last week by The Omni Group Ltd. The study indicates that more than 40% of the Fortune 500 Industrial and Service companies currently use some form of local-area networks, and that by 1985, that figure is expected to rise to 72%.

The survey shows that a significantly lower number of small and medium-size firms currently employ local-area networks, but the anticipated growth rate in these markets is "enormous." The study did not question respondents as to how extensive they expect their use of local-area networks to be in the future, nor did it ask whether they plan to purchase or develop in-house their local-area networks.

Dr. Warren Waldbrand, research director for The Omni Group, added, "To say that nearly 75% of the Fortune 500 companies will have local-area networks by 1985 certainly doesn't mean that 75% of the people who work in those companies will be tied together through one."

Added Randy J. Goldfield, president of The Omni Group: "It is clear from this study that respondents have a good understanding of word processing equipment and personal computers. But there is a lot of confusion as to the linkage between these tools."

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AT&T offers two sets of Unix-based superminis

By John Gix
and Tom Henkel
CW Staff

NEW YORK — AT&T brought out its first commercially available computers here last week, unveiling a family of superminicomputers that has been adopted from its large telephone switching systems along with a line of mid-range superminis based on newer technology developed by Bell Laboratories and cast in silicon by what used to be Western Electric Corp.

Available immediately, both sets of superminis in the so-called 3B processor family — the high-end 3B20 and the mid-range 3B5 — have a 32-bit architecture and come bundled with the Unix System V operating system.

The 3B20 superminis are built on a processor that the former Western Electric has employed in its large Electronic Switching Systems for some time. Using bit-sliced, bipolar chip technology and 64K-byte random-access memory chips, the 3B20 is available in three models, the 3B20S, 3B20A and 3B20D.

Pushing the systems' purported reliability, AT&T claimed that all 3B systems will experience only 10 minutes of downtime per year.

The 3B20S is a single-processor supermini that is touted as being nearly twice as reliable as other commercial computers and capable of withstanding temperature ranges of 32 F to 122 F. Supporting up to 100 users, the 3B20S performs at a rate of roughly one million instructions per second.

The $230,000 uniprocessor comes with 2M bytes of internal memory, a 300M-byte, removable-media disk drive, a 16K bit/in. tape drive, eight asynchronous ports, a CRT and a printer.

AT&T claims that 550 Model 3B20S superminis are presently being used by the former Bell operating companies to support office automation programs and data processing tasks.

With the addition of a growth module, the 3B20S can be upgraded to the 3B20A, an attached-processor system. The 3B20A costs 30% more than the single-processor system, but offers nearly double the performance of the 3B20S, supporting a maximum of 150 to 180 users. The 3B20A has 4M bytes of main memory, but otherwise, at $330,000, comes with the same peripherals as the uniprocessor.

The A model uses parallel processing, with both processors performing operating system calls independently, AT&T Technologies said. The 3B20A is the only system in the 3B20 product group that is not presently used within AT&T or any of the former Bell operating companies.

The top of the 3B20 line is the 3B20D, although neither 3B20S nor 3B20A users can upgrade to this system. The D model is a dual-processor supermini intended for transaction processing applications such as banking and financial services. It can stay on-line during maintenance, software updates and system administration, AT&T Technologies said.

The performance of the 3B20D system is similar to that of the uniprocessor 3B20S because one of the two processors is kept as a hot standby and not used unless the other processor falters.

A 3B20D uses the same processors and peripherals as the attached processor 3B20A, but comes with a 340M-byte disk and costs $340,000.

The 3B5 family of mid-range superminis announced last week by AT&T Technologies includes the 3B5/100 and 3B5/200, which bracket Digital Equipment Corp.'s VAX-11/750 in terms of performance.

Both systems use AT&T Technology Systems Group's WE-32000 32-bit microprocessor and that manufacturer's 256K-byte random-access memory chips.

The 3B5/100 is said to support a maximum of 30 users and the 3B5/200 a maximum of 60 users. As with the 3B20 series, neither of the 3B5 computers has special air conditioning or power requirements. Diagnostics are firmware-based and are automatically executed when the system is turned on, AT&T reported.

A basic 1M-byte 3B5/100 costs $57,000 with a 48M-byte hard disk, an asynchronous interface and an 8K-byte cache memory.

A 2M-byte 3B5/200 with an I/O accelerator and extended bus as well as the 48M-byte disk, asynchronous interface and 8K-byte cache memory runs for $73,000.

AT&T'S NEW PROCESSORS

Characteristics \ System	3B20S	3B20A	3B20D
Relative Performance[1]	60	95	95
Mips[2]	1	1.8	1.8
Memory Size in Bytes (Minimum-Maximum)	4M-12M	4M-12M	4M-16M
Purchase Price[3] (Memory Size)	$230,000	$330,000	$340,000
Lease Price (Lease Term)	None	None	None
Machine Cycle Time (Nsec)	Not Available	Not Available	Not Available
Channels (Minimum-Maximum)	3-16	Not Available	Not Available
Cache (Buffer) Size	8K	12K	16K
Bus Architecture	Yes	Yes	Yes
Price per 1M Byte Of Main Memory	$4,900	$4,900	$4,900[4]

1. CW estimates based on vendor-supplied information. Relative performance ratings are based on an IBM 370/158-3 equaling 45. These numbers are designed to put the processor into perspective with other systems; they do not constitute a buyer's guide. All systems are not alike; they use different operating systems, instruction sets and architectures and, therefore, cannot be directly compared. In addition, actual relative performance may vary with the application, peripherals and software.
2. CW estimates.
3. For a basic configuration.
4. For a dual-processor configuration, users must install memory in 2M-byte increments, which cost $8,900.

CW Chart

SOME MAJOR COMPETITORS OF AT&T'S 3B20 PROCESSORS

Characteristics \ System	Data General Corp.		Digital Equipment Corp.		IBM		
	MV/8000 II	MV/10000	VAX-11/750	VAX-11/780	4361-5	4341-12	4381-1
Relative Performance[1]	71	138	40	62	66	75	100
Mips[2]	1.2	2.5	.72	1.06	1.14	1.2	2.1
Memory Size in Bytes (Minimum-Maximum)	1M-8M	1M-16M	512K-8M	512K-8M	2M-12M	2M-16M	4M-16M
Purchase Price (Memory Size)	$126,250[3] (1M)	$211,070[3] (2M)	$84,900[4] (1M)	$184,000[4] (2M)	$200,000[4] (2M)	$500,000[4] (2M)	$370,000[4] (4M)
Lease Price (Lease Term)	None	None	None	$None	$3,800 (5 Year)	$21,650 (2 Year)	$7,030 (5 Year)
Machine Cycle Time (Nsec)	220	140	320	200	100 (For 4 bytes)	115-230	68 (For 4 bytes)
Channels (Minimum-Maximum)	2	3	1-5	1-8	3-6	6	6-12
Cache (Buffer) Size	16K	16K	4K	8K	16K	16K	6K
Bus Architecture?	Yes	Yes	Yes	Yes	Yes	No	No
Price per 1M Byte Of Main Memory	$4,900	$4,900	$4,900	$4,700	$7,500	$15,000	$10,000

1. CW estimates based on vendor-supplied information. Relative performance ratings are based on an IBM 370/158-3 equaling 45. These numbers are designed to put the processor into perspective with other systems; they do not constitute a buyer's guide. All systems are not alike; they use different operating systems, instruction sets and architectures and, therefore, cannot be directly compared. In addition, actual relative performance may vary with the application, peripherals and software.
2. Vendor claims.
3. For the processor with disk and tape units, system software and console.
4. Includes processor, console, power supply, systems software and a minimum tape and disk configuration.
5. For the processor only.

CW Chart

Many vendors offer systems that compete in the same general performance range as AT&T's new processors; the above chart includes representative models from three of the top vendors in the high-end superminicomputer market. For a more complete listing of superminis, see *Computerworld*'s annual Hardware Roundup (CW, Aug. 8).

AT&T from page 1

vendor, David C. Moschella, an industry analyst with International Data Corp. of Framingham, Mass., noted that AT&T's market entrance will have a "limited effect because it is not yet addressing the end-user market.

"While it is clear AT&T will eventually address that market," Moschella said, it will not do so until it has competitive office software products.

"High tech, high price" is how David L. Terrie, director of office systems research at The Yankee Group of Boston, summed up the announcement. AT&T and its products are "not in the price/performance range of any of its competition, including [Digital Equipment Corp.]," Terrie said.

An AT&T spokeswoman said that AT&T intends to discount the products according to industry standards.

AIM appoints two new board members

CHICAGO — The Association of Information Managers (AIM) has appointed two new board members, Glenn Dean and David Martin.

Dean is marketing director of Data Line Service Co. of Covina, Calif. Martin is executive vice-president of the Provident Bank of Maryland in Baltimore.

AIM is a national professional organization that provides management and technical skills to individuals who plan, develop, implement and operate automated support systems. It is based at Suite 2221, 111 E. Wacker Drive, Chicago, Ill. 60601.

AT&T's 32-bit supermicro a multiuser, desktop unit

By Eric Bender
CW Staff

NEW YORK — AT&T Technologies, Inc.'s 3B2/300 supermicro, unveiled here last week, is a 32-bit desktop system with a base price of $9,950. Based on AT&T's proprietary WE 32000 microprocessor and running under the Unix System V operating system, the 3B2 can act as a powerful single-user system or support up to 18 users.

Jack Scanlon, vice-president of AT&T's Computer Systems Division, noted that the 3B2 offers performance comparable to minicomputers available a few years back and said he expects the new system to have a major impact on the multiuser desktop market. He predicted initial sales would be for computer-aided design and manufacturing, engineering tasks and small business uses.

The 3B2, now shipping to first customers, is housed in a compact desktop unit and weighs about 30 lb. The system features 512K bytes of random-access memory (expandable to 2M bytes), a single 720K-byte floppy disk drive and a 10M- or 32M-byte hard disk drive. The base price of $9,950 does not include terminals.

Add-on components include automatic dial/answer facilities, draft-quality dot matrix printers, a letter-quality printer and plug-in cards.

The 3B2 is said to be fully compatible with the other 3B products introduced here last week and to connect with them via AT&T's new 3BNet local-area network, also announced last week (story at right). AT&T said that when its PC Interface is offered, in the third quarter, the supermicro will be able to function as a Unix host for personal computers.

Several industry analysts commented favorably on the 3B2's price and performance characteristics, speculating that the AT&T label will help sales because buyers will not be worried about AT&T's staying power. Most suggested that the system would not compete directly against current IBM offerings, but instead against minicomputers and supermicros from Digital Equipment Corp., Data General Corp. and others.

"The 3B2 seems reasonably close to our product line," said James Campbell, president of Fortune Systems Corp., a supplier of multiuser Unix-based systems built around the Motorola, Inc. 68000 chip. However, AT&T's new systems will be "a very powerful endorsement" for Unix-based systems from other vendors, Campbell said.

President of Altos Computer Systems, Inc., David Hanna, said, "We expected the announcement, and I'm delighted. A lot more application code will be developed for Unix now that AT&T has blessed it with hardware."

AT&T's Scanlon claimed that during the last year, AT&T's strong push behind Unix System V has moved it beyond "academics and technical gurus" to acceptance as an industry-standard operating system.

However, observers generally agreed that the new AT&T machines still will be short on application software. "There's a requirement for broad-based applications from AT&T," said George Colony, president of Cambridge, Mass.-based Forrester Research, Inc. Colony predicted that sales will be slow until AT&T offers "office automation products, Unix tool kits and maybe some vertical applications."

Many observers expect AT&T to launch other lower end microcomputers later this year, and the "300" designation on the new system was seen supporting that expectation. "If there's one thing missing in this announcement, it's a personal computer," Colony said.

AT&T local net quintuples throughput of Ethernets

By Phil Hirsch
CW Washington Bureau

NEW YORK — A high-speed, Ethernet-compatible local-area network was unwrapped here last week by AT&T Technologies, Inc.

Dubbed 3BNet, it has five times the throughput of Ethernet-type local-area networks already on the market, while stealing significantly fewer processing cycles from attached host processors, according to Vice-President Jack Scanlon, who heads the company's Computer Systems Division.

Scanlon said 3BNet is available immediately to value-added resellers and users capable of developing the related application and interface software. Value-added resellers, which include many of the recently divested Bell operating companies, will add application and interface software, and possibly additional hardware, to the new network to meet the needs of specific types of users.

The main applications of 3BNet, Scanlon said, are computer-to-com-

See 3BNET page 10

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'Intellect' tied to SQL/DS under VM/SP, DOS/VSE

By John Gallant
CW Staff

WALTHAM, Mass. — Artificial Intelligence Corp. (AIC) last week announced two additional versions of its Intellect natural-language query system. The new versions reportedly provide an interface to data bases maintained by IBM's SQL/DS under the VM/SP and DOS/VSE operating systems.

According to AIC, the newest versions of Intellect were designed to enable users to query SQL/DS data bases under VM/SP using CMS or DOS/VSE with IBM's CICS teleprocessing monitor. An optional interface to IBM's Presentation Graphics Facility (PGF), which allows users to produce a variety of charts and graphs, is also available with both versions of Intellect.

The Intellect natural-language query system gives users the capability to access, retrieve and display information resident on an IBM mainframe in conversational English using a flexible lexicon that can be updated and customized to suit unique environments, an AIC spokesman said. Intellect's lexicon consists of over 400 common English words and phrases that apply to all data bases defined by the user, he said.

The latest versions of Intellect are intended to enhance the software's usefulness as an information center tool, AIC said. In June, IBM announced that it would market Intellect for its DOS/VSE, MVS and VM environments — a move that industry analysts viewed at the time as an attempt to beef up the offerings for the industry giant's strongly marketed information center concept [CW, June 20].

The AIC spokesman said that in its information center role, Intellect acts as a front-end supervisor to a variety of data base, statistical analysis, graphics and spreadsheet packages available for the IBM Personal Computer and compatible microcomputers. AIC claims to have installed more than 200 copies of Intellect in the mainframe arena in the past two years.

AIC said the new versions of Intellect offer a number of built-in features, such as the capability to handle European-format date reporting and new documentation. The documentation includes an Intellect reference card outlining the software's processes, commands and capabilities and the "Guide to Implementing Intellect," which covers planning, resource scheduling, application selection and user training.

The new versions, dubbed Intellect DOS/SQL/CICS and Intellect VM/SQL/CMS, are available immediately. Intellect DOS/SQL/CICS is priced at $40,500, and Intellect VM/SQL/CMS is priced at $60,500. The PGF option is priced at $15,000.

AIC is based at 100 Fifth Ave., Waltham, Mass. 02254.

3BNET from page 9

puter file transfer and similar jobs that require large quantities of information to be moved quickly. An AT&T Technologies spokesman added that its major use, aside from offices, will be in engineering, computer-aided design and manufacturing and factory automation.

Two 3BNet interfaces are available. One is a $7,000 three-card set for AT&T's newly announced 3B20 and 3B5 superminicomputers; the second is a $3,000 single-card interface for AT&T's 3B2/300 supermicro.

"3BNet's major advantage over existing networks is that it is intelligent and self-maintaining. All the protocol, flow control and maintenance overhead is deloaded from the connected host computers," Scanlon said. The result is that 3BNet requires "a fraction of the host computer load" needed by competing Ethernet-type systems.

Scanlon added that 3BNet's throughput, end-to-end, between application programs in attached host computers is about 500K bit/sec. He claimed this is five times greater than the throughput provided by competing contention-based local-area networks.

The new AT&T network accommodates any computer or other terminal device that supports Levels 0 and 1 of the IEEE 802 Ethernet specification, the spokesman said. Through attached host processors, it can be linked to other networks, including Datakit, a lower speed, wider area network introduced earlier this year by AT&T Technologies.

A "rich set" of higher level protocols — up to Level 7 of the International Standards Organization's Open Systems Interconnection model — is available to 3BNet users, the spokesman reported, adding that "some software modifications" at the host level may be necessary before non-3B computers can work on the 3BNet. He explained that AT&T has enhanced the IEEE Ethernet specification in some respects. Notably, the user can employ packets up to 4,000 bytes long rather than the 1,600 bytes specified by the IEEE 802 committee.

According to the 3BNet specifications released by AT&T Technologies, the coaxial cable-based network has a 10M-bit transfer rate. The maximum coaxial segment length is 500 meters, and up to 100 taps are permissible per segment.

WANG from page 1

vendor spokesman.

Up to 20G bytes of data can be stored on disk drives attached to the VS 300. This is possible by attaching varying combinations of up to 32 disk units. These include two disk drives announced by Wang along with the VS 300: a 340M-byte fixed media disk drive with a data transfer rate of 2M byte/sec and a 76M-byte removable media disk drive with a data transfer rate of 1.2M byte/sec.

Up to 15-microprocessor-driven I/O controllers can be used to direct workstations, printers, tape drives, disk drives, the firm's Wangnet local-area network and telecommunications links. By offloading peripheral control functions from the CPU to the I/O controllers, internal throughput of the CPU is improved, the Wang spokesman said.

Further, the VS 300 is available with a floating-point accelerator designed to improve throughput in scientific applications using Fortran, Basic or PL/I programming languages, the firm said.

The VS 300 can be equipped with an optional battery backup device that offers the user power for up to 90 seconds after a power failure. Diagnostic features for the supermini are incorporated into a Support Control Unit, which allows the user to perform both local and remote diagnostics. Remote diagnostics can be carried out over a switched network, Wang said.

The VS 300 will be available next January. A basic configuration, including a CPU with 4M bytes of main memory, the enhanced release of the VS operating system, console, workstation, serial I/O controller and assembler, costs $170,000. The 364M-byte disk drive costs $28,000, and the 76M-byte removable media disk unit costs $12,000. The optional floating-point accelerator costs $10,000, and the optional battery backup unit is priced at $7,000.

Wang announced the VS 300 from its corporate headquarters at One Industrial Ave., Lowell, Mass. 01851.

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NEWS

Half of firms polled plan second-quarter DP hiring

By Edward Warner
CW Staff

CLEVELAND — Half of the companies polled by a recruiting firm in a national survey plan to hire new data processing staff during the second quarter, and only 5% plan to reduce their staffs.

The quarterly survey, which polled executives with DP hiring responsibility in 424 firms, was conducted by local branches of Management Recruiters International, Inc.'s Compusearch Division. Compusearch's first-quarter survey indicated that 55% of respondents planned to hire.

The survey did not, however, ask how many people each of the respondents was planning to hire during the coming quarter.

Compusearch director Marc Blessing attributed the survey's indication of growth in DP hiring to what he called a changed perception on the part of top corporate managers, a change that, he said, came in part because of the competitive edge data processing gave their firms in the recent recession.

"I think [the survey] reflects the direction that data processing is headed in," Blessing said. "It reflects the surface benefit of data processing and that data processing is no longer considered an overhead expense, but an investment in the company."

'[The survey] reflects . . . that data processing is no longer . . . an overhead expense.' — Marc Blessing, Compusearch.

More proliferation

Blessing also credited the proliferation of microcomputers in offices with encouraging DP hiring and said demand exists for data processing staffers who can manage the coming transition to office automation.

Blessing noted that the survey showed the greatest hiring growth in the New England and Middle Atlantic states, where 70% of the executives surveyed expected to hire new data processing staff.

But, he added, "There are tremendous opportunities throughout the country."

The Southwest region, an area including Texas, Oklahoma, Arkansas and Louisiana, had the poll's lowest level, with 26% of surveyed executives planning to hire.

Blessing blamed this on that area's economic dependence on oil and gas prices.

Asked in the latest survey whether they would be willing to work two to three days at home using computer equipment that would link them with their offices, 36% of the executives surveyed said they favored the idea, and 48% opposed it.

The survey focused on data processing executives in all industries. When DP executives working only in the data processing industry were asked if they favored working at home, 52% favored the idea.

Introverted nature

Blessing said the favorable responses might result from what he called the introverted nature of many data processing workers and their high level of task-orientation.

The survey is the 11th in a series of quarterly polls taken by Compusearch. The surveys have previously shown a high degree of accuracy, compared with later government reports, according to Management Recruiters International spokeswoman Nancy Valent.

"We've seen a parallel between what we're doing and what's happening out there," she said.

Copies of the survey are available at no charge from Management Recruiters International, located at 1015 Euclid Ave., Cleveland, Ohio 44115.

Compusearch data

Second-quarter 1984 hiring projections for data processing staffs are listed as regional percentages of companies planning to increase staff size.

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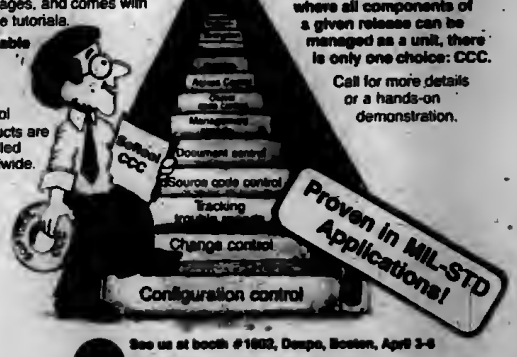

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Will Easytrieve-Plus prove a minus for current users?

CW AT PULSE

By Paul Gillin
CW Staff

NEW YORK — What does the introduction of Easytrieve-Plus mean for current users of Pansophic Systems, Inc.'s popular Easytrieve software?

That was a question some users were trying to answer at the Pansophic Users Learning and Sharing Exchange (Pulse) meeting held here last week.

The users questioned Pansophic's somewhat ambiguous announcement of Easytrieve-Plus in January. Although billed as an enhancement to Easytrieve, the product is basically a renamed version of Pro/Grammar, a programming productivity language introduced by Pansophic in February 1982. Pansophic announced that Easytrieve customers would receive Easytrieve-Plus as a maintenance enhancement and that Pro/Grammar would no longer be offered as a separate product.

The announcement "totally confused us," said William Remski, a DP auditor at General Motors Corp. in Detroit. "I'm always skeptical of something being given away for nothing. We were also told Pro/Grammar was not an end-user product, and I think the information center is the way of the future. We figured Pansophic was gravitating away from the end user."

With several hundred users now conversant in Easytrieve, GM feared that the Pansophic announcement would require massive retraining. "The logic structures in Easytrieve-Plus and Easytrieve are entirely different," Remski observed.

Dale Scheer, administrator of corporate audit at GM, added that "there have got to be a lot of programs that are incompatible with Easytrieve-Plus. We were told there were no plans to make that conversion easy." As a result, Remski noted, "We've got to stay with Easytrieve."

Steve Miehe, a team leader at Life Investors, Inc., a Cedar Rapids, Iowa-based insurance company, agreed. "I don't think [Easytrieve and Easytrieve-Plus] are similar at all," he said. Miehe added that he believes Pansophic should provide a compatibility mode that allows the new version to run existing Easytrieve programs. "I think Pansophic is expecting Easytrieve to die," he said, "but I think they'll be surprised at how long it hangs on."

However, Pansophic's president and chief operating officer, David Eskra, said the company believes migration to Easytrieve-Plus "is in the best interests of all users. The more you wanted to do with Easytrieve, the harder it became," he explained.

Eskra admitted that no conversion aids will be provided to allow users to move Easytrieve code to the new product. But he said that the command and logic structures of Easytrieve-Plus are "about 85% similar" to those of Easytrieve and that migration is not a major chore.

"Of course, we will continue to support Easytrieve," Eskra said. Migration to Easytrieve-Plus "will be made more desirable by the addition of attractive enhancements to the new product." But he added, "We can't continue to enhance Easytrieve." While Pansophic will still support the old product, it will cut back on Easytrieve training unless customers indicate that training is still needed. "We're not like IBM in that we announce new products and then kill off old products," he said.

Cobol becoming a casualty of insurance firm's productivity tool

CW AT PULSE

By Paul Gillin
CW Staff

NEW YORK — A batch programming productivity tool is in such widespread use at a Cedar Rapids, Iowa, insurance company that "as an unofficial rule, if someone wants to write in Cobol, he has to have a pretty good reason," a team leader in the DP shop said here last week.

Life Investors, Inc. uses Pansophic Systems, Inc.'s Easytrieve-Plus (formerly Pro/Grammar) for about 75% of its batch programming, according to Steven Miehe, the team leader. Miehe was interviewed at the Pansophic Users Learning and Sharing Exchange (Pulse) conference here.

Life Investors recently converted from Burroughs Corp. equipment to IBM hardware and now runs an IBM 3033 mainframe under IBM's MVS operating system with Vsam files, TSO and ISPF (Interactive System Productivity Facility) and between 50 and 75 on-line terminals. Other Pansophic products in use at Life Investors include Easytrieve, MIS/OL (Management Information Systems/On-Line), Panaudit and Panvalet.

Investors Life acquired Easytrieve-Plus early last year as part of its conversion. The company is now installing several major applications packages. While most of the systems programming staff is working on conversion and installation, those who are writing new code primarily use Easytrieve, MIS/OL and Easytrieve-Plus, Miehe said.

Miehe, who has been an assembly language and Cobol programmer and data base administrator, said Easytrieve-Plus is one of the few tools he has seen that does not sacrifice flexibility for productivity, although he noted that programs that require extensive customization can probably be done about as quickly in Cobol.

"You do have to adjust the operation of your shop somewhat," he said. "Whereas in the past you had to write up report layouts or spec sheets, we now use a lot of standard reports. If the user wants a report to [meet] exact specifications, he has to be ready to pay for the extra time."

Standard reports can be generated in as little as five minutes, he said, and unlike Cobol, Easytrieve-Plus can be used by some end users. "We started by giving Easytrieve to users and keeping Easytrieve-Plus for ourselves," he recalled, "but we found quickly that sophisticated users wanted to do things that could be better done in Easytrieve-Plus. We actually have some end users writing more Easytrieve-Plus code than our DP people."

However, Miehe added that he has used Easytrieve-Plus for some complex coding. For example, he wrote one production release application that is used in moving an application to production. The software enables the programmer to specify program calls and other resources used by the application and then builds a set of JCL and a history file to prepare the program for production. The code is used by operations to move the application into production.

The software, which formerly would have been written in Cobol or assembler, was written entirely in Easytrieve-Plus, Miehe said.

Easytrieve-Plus offers several improvements over Cobol, according to Miehe. An automatic input feature runs through program logic every time a file is read, eliminating worries about end-of-file coding. The report writer is more powerful than Easytrieve's, and the product includes "some very sophisticated match/merge type of logic." All work files and reports go out to a single IBM OS data set, saving JCL, and Easytrieve-Plus has a facility that allows multiple job steps to be performed within a program.

Miehe noted that unlike Easytrieve, Easytrieve-Plus uses a structured programming language that is similar to PL/I. Calls to subroutines from packaged applications can be placed within Easytrieve-Plus code, and the software offers the flexibility to create both executable code and object code modules, simplifying testing, he said.

All this adds up to as much as a 75% cost savings by programming in Easytrieve-Plus rather than Cobol, Miehe said.

"Some programmers believe they can write faster in Cobol — and that may be true on the first program," he said. "But I haven't gone back to Cobol since we've had Easytrieve-Plus."

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NEWS

Pansophic's Gener/ol outbenches Cincom's Mantis

CW AT PULSE

By Paul Gillin
CW Staff

NEW YORK — In a test that few DP shops can afford to emulate, Pansophic Systems, Inc.'s Gener/ol application development system took on Cincom Systems, Inc.'s comparable Mantis software and won.

The two products were pitted against each other by Amer-Cal, Inc. of Arlington Heights, Ill., a $3.5 million service bureau that includes separate divisions for office services; letter, label and list processing; data processing; and software support. In a session at the Pansophic Users Learning and Sharing Exchange (Pulse) conference here last week, Amer-Cal Vice-President Lonnie Lanzer described the process that led to the benchmark and Amer-Cal's subsequent decision to write all its new on-line applications in Gener/ol.

Exponential growth has led Amer-Cal to upgrade its CPU capacity seven times in the last four years, Lanzer said. The company now runs two IBM 4341 processors under IBM's DOS/VSE and VM/SP operating systems with 16 dedicated communications lines and 185 on-line terminals at customer sites nationwide.

When Amer-Cal upgraded to 4300 series CPUs five years ago, it decided to use application development systems instead of Cobol in order to bypass traditional development cycles and long coding times. Such traditional approaches tend to frustrate the development effort by forcing the user to decide what he doesn't like about an application only after it has been written, Lanser said.

CW Photo by P. Gillin

Lanzer

Amer-Cal considered some of the most popular application development systems before choosing Mantis in 1980. Early experiences were overwhelmingly successful, Lanzer said. For example, an on-line order entry system that had 70 on-line and 125 batch programs using 17 IBM Isam files was converted from Cobol to Mantis in just 10 man-weeks. The original application had taken 39 man-months to write.

Mantis was also used extensively for prototyping. In four years, Amer-Cal has written over 6,500 on-line Mantis programs.

With daily on-line usage growing from 2,500 transactions in 1980 to 40,000 transactions in 1983, however, the company was constantly on the lookout for new productivity tools, Lanzer stated. Last November, Amer-Cal selected Gener/ol, its first Pansophic product, to benchmark against Mantis.

Gener/ol offers identical features for naming conventions, program function and size, screen design layout, help aids and menu-driven execution. "But that's where the comparison ends," Lanzer said.

The application selected for benchmarking was a high-volume accounts receivable system containing a menu for 13 different functions and multiple versions of the program to suit different users. In both the data entry and display functions, the programs handle multiple pages of a screen and 34 different client entries. In the data entry program, all fields must be validated and, when keying errors are detected, all error fields must be highlighted. In the display program, the records displayed are retrieved, sorted into a different sequence and stacked before display.

Amer-Cal wrote both programs using the most efficient code it could create, Lanser said. The result was a 30% to 50% reduction in CPU execution time for the Gener/ol version of the application over a "mirror image" written in Mantis.

Specifically, Gener/ol required 207 program lines for data entry and 71 program lines for display with sort compared to Mantis figures of 334 and 201 lines, respectively. Response time for data entry, including validation, adding records to client batch and updating batch totals, was 90 seconds compared to 121 seconds for Mantis. Response time for the display function was seven seconds in Gener/ol, 17 in Mantis.

Another major Gener/ol benefit was seen in reduced I/Os, largely as a result of Gener/ol's ability to read forward and backward and its sort feature, which eliminated the need to build a work file and read it back, Lanser said. A typical data entry procedure required 82 I/Os in Gener/ol vs. 211 in Mantis. A display function consumed 53 I/Os against 233 in Mantis.

In all, Lanser claimed, "Gener/ol has everything Mantis has plus additional features and large performance improvements." Some of the additional features she found most helpful were generation of compiled code, sort facilities, array handling, backward reading of IBM Vsam files, unrestricted program size and redefinition of data between numeric and nonnumeric fields.

"For the first time in four years, we can anticipate our CPU power needs remaining stable for more than a few months," Lanser stated. In addition to committing all new, on-line development to Gener/ol in the future, Amer-Cal has elected to rewrite a major piece of Mantis-developed software for the copier dealer industry in Gener/ol. The application, which includes over 500 programs, is slated to be finished in July and will be done by a team of only three programmers.

Series/1 user migrates via 3033

CW AT PULSE

By Paul Gillin
CW Staff

NEW YORK — Going from an IBM Series/1 minicomputer to an IBM 4341 by way of an IBM 3033 mainframe may seem a roundabout way of doing things. But Hohenberg Bros. Co. of Memphis, Tenn., had little choice when it made that conversion two years ago.

Hohenberg's Series/1 was seriously overloaded with more than 500 programs, according to David M. Deutsch, a systems programmer. What was worse was that the programs were written entirely in IBM's EDL, which is unique to the Series/1. And none of the Hohenberg programmers was fluent in another common business programming language.

Hohenberg decided to handle the conversion from the Series/1's EDX operating system to the 4341's DOS/VSE operating system using the 3033 corporate mainframe under the OS operating system at the headquarters of its parent company, Cargill, Inc., in Minneapolis. The conversion also entailed rewriting the Hohenberg program library in PL/I.

In an interview at the Pansophic Users Learning and Sharing Exchange (Pulse) meet held here last week, Deutsch described why the convoluted tactic made good business sense and how Pansophic Systems, Inc.'s PAN No. 1 utility of its Panvalet library management software enabled Hohenberg to save money.

Fortunately, Cargill had a staff of programmers who were conversant in both EDL and PL/I. Between the time that the 4341 was ordered and the time it was delivered, Hohenberg shipped about 375 EDL programs to Minneapolis, where seven programmers analyzed and rewrote them in PL/I on the 3033. The programs were then stored in a Panvalet library on the 3033.

The 4341 was delivered to Cargill in April 1982. Deutsch explained that the decision to deliver there rather than Hohenberg was made because it was cheaper to run the conversion at corporate headquarters than to fly a team of programmers to Memphis. Although only about three-quarters of the program library had been converted at the time of delivery, Hohenberg decided to finish the rewrite on the 3033 and then dump the whole library onto the 4341 at once.

The transfer was accomplished by dumping the Panvalet source library to tape and executing PAN No. 1, inserting PAN No. 1 control cards as "bookends" around the programs to act as delimiters. The control cards, in turn, are recognized by IBM's DTS/Util, a utility that runs under IBM's ICCF (Interactive Computing and Control Facility) on the 4341.

Deutsch said that without the use of the two library utilities, Hohenberg would have had to rekey about 34.5 million characters of code into the 4341. Realistically, such a process would have cost a minimum of $20,000, he said.

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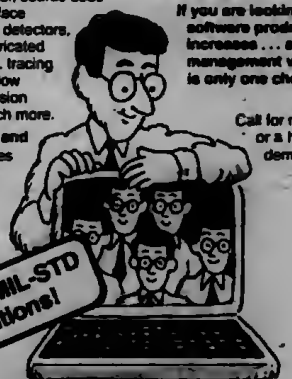

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Reagan gives DOD power to review computer exports

By Bryan Wilkins
CW Washington Bureau

WASHINGTON, D.C. — President Reagan has given the U.S. Department of Defense (DOD) the power to review exports of computers, test equipment and microchip manufacturing parts to 12 noncommunist countries widely suspected of being shipment points to the Eastern bloc.

The decision to give the review power to DOD has prompted concern from American computer manufacturers of the products affected, who fear that delays in obtaining export approval will mean lost sales to foreign competitors. The American Electronics Association said it was "disappointed" by the action.

The six commodity categories that will be subjected to DOD review if an exporter seeks to ship them to any of the 12 countries are:

■ Machinery and equipment for the manufacture of electronic equipment, components and materials and related test gear. This includes semiconductor manufacturing items, software, lasers and digitally controlled automated equipment.

■ Electronic measuring, calibrating, counting, testing and time interval equipment, whether or not it incorporates frequency standards. This category also includes digital test instruments with user-accessible programming capability.

■ Electronic computers, including those that have been "ruggedized" for military purposes, and data communications switching gear such as packet switches.

■ Computers equipped with CRT terminals, not including printers and paper readers that run at speeds less than 2,500 char./sec. This category does not include peripherals that contain their own microprocessor controls.

■ Silicon compounds used in chip manufacture.

■ Crystal sapphire substrates, which are also used in chip production.

Undersecretary of Commerce for International Trade Lionel Olmer has predicted that the DOD review will triple the review work load for DOD, which was already reviewing all exports to communist countries.

The U.S. Department of Commerce declined to reveal the 12 countries singled out for the license review, but officials confirmed the countries include Switzerland, Austria, Sweden, Finland, Liechtenstein, South Africa, India, Hong Kong and Singapore.

The Reagan order does not give DOD review power over distribution licenses issued to companies for a broad group of products. Instead, DOD will initially review only individual export licenses.

However, the order does state that DOD will have the power to review distribution licenses in the future if it proves it can efficiently administer the review of the individual licenses.

Meanwhile, a House-Senate conference last week began hammering out the differences between two bills authorizing the renewal of the Export Administration Act, which was due to expire last Friday.

Calif. execs sentenced for trying to smuggle disk equipment to Bulgaria

By James Connolly
CW Staff

LOS ANGELES — The owner of a California firm has begun serving a three-year federal prison term after pleading guilty to charges that he tried to ship $750,000 worth of computer disk manufacturing equipment to Bulgaria.

Edward F. King, owner of Printemps Corp. of Yorba Linda, Calif., was sentenced and fined $20,000 by U.S. District Judge Lawrence T. Lydick here last month after King pleaded guilty to charges of conspiracy and illegal exportation. Printemps' chief financial officer, Louis R. Klements, pleaded guilty to conspiracy and was placed on probation for five years and fined $5,000.

According to a federal prosecutor, Printemps shipped two disk polishing devices to Bulgaria and tried to ship two coating devices in 1982 and 1983. King allegedly acted as a go-between and bought the equipment from a California manufacturer at the request of two Bulgarians and Hendrik Wasmoeth of the Netherlands. Wasmoeth and the Bulgarians were indicted with King and Klements in November 1983, but are believed to be outside the U.S.

Assistant U.S. Attorney William F. Fahey told the court King was employed as a consultant by Wasmoeth on behalf of the Bulgarians in their attempts to buy the equipment from a firm here. The equipment was to be used to build a computer manufacturing plant in Bulgaria, Fahey said.

When the company here failed to obtain export licenses, Fahey said, King decided to obtain the equipment himself. He shipped the first two pieces of equipment through Holland to Bulgaria in 1982. The coating equipment was seized by U.S. Customs agents at Los Angeles Executive Airport in January 1983.

Fahey charged that King's agreement called for him to ship $750,000 worth of equipment and said that the equipment was "licensable by the Commerce Department." He said Printemps failed to obtain the appropriate licenses.

"King's motive was clear: greed," Fahey said at the sentencing. "The equipment was obviously something the Bulgarians were very interested in and willing to pay top dollar for." Fahey said King's conduct was "designed to aid the Soviet bloc country in balancing the technological scales with the U.S."

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NEWS

Report slams studies linking VDTs, health risks

By Lynn Haber
CW Staff

SANTA MONICA, Calif. — Contrary to recent reports that video display terminals are health hazards, a study released here by The Koffler Group claims there is no scientific evidence that VDTs pose any threat to the health or safety of users.

"The VDT Health Debate and the Importance of Research Methods" reviews six VDT-related studies. They include two by the National Institute for Occupational Safety and Health (Niosh); one by Dr. Arthur Frank and the Newspaper Guild; a study by Starr, Thompson and Shute of Bell Telephone operators; a report by the Canyon Research Group, Inc.; a study by DeGroot and Kamphius done with telephone information operators in Denmark; and a report by the National Research Council.

Those studies were selected because they have received significant press attention and caused a lot of "sensationalism," according to the author of The Koffler Group's report, Dr. Karen Kessel. Kessel is editor of "The Office Systems Ergonomics Report" — published by Koffler — and vice-president of research for the company.

"When I went back to look at some of those studies, to my horror I discovered they were terrible. They were not responsible, and you couldn't derive anything from them," Kessel said in a recent telephone interview. Kessel, whose academic background is in experimental psychology, cited as an example a 1981 Niosh study. "This study was basically done at the request of the unions, which already felt that there was a VDT problem. So, in other words, they were loading the dice.

"The researchers went into a situation where there was excellent reason to believe that people were already reacting negatively due to computers, but nobody knows why. There could have been a million variables that could have accounted for that, everything from the unions wanting more power to who knows what."

Niosh response

Contacted for her comments on the Koffler report, Barbara Cohen, one of the researchers involved in the Niosh study, said the health hazard evaluation was initiated by a consortium of five unions. "Any employee, any union, can request a health hazard evaluation if they feel there's a health hazard in their work place," Cohen said. "The mission of Niosh, as a government agency under the [Department of Health and Human Services], is to assure safe working conditions for every man and woman in the U.S."

She added, "Most people that know the government know Niosh's work [and] know that it is a neutral agency. It must be a neutral agency to do the studies."

Another recent study Kessel targeted in her report was "Effects on Health Following Occupational Exposure to VDTs," carried out by Dr. Arthur L. Frank with the Newspaper Guild. According to Kessel, this study was so bad "that it made the Niosh studies look wonderful."

Kessel said she was "actually quite angry after reading that study because that is exactly the kind of sensationalism that everybody hears about. Nobody I know reading the newspapers would be hearing the other side of the coin. That study, in my opinion, was so bad [that] not only can't you derive anything from it, but the researcher was terribly irresponsible. . . . If you can't do science right, then don't do it at all."

Among Kessel's 16 complaints against the Frank report were her contentions that Frank discussed VDT radiation testing in his study, yet never actually investigated it; that he used union members both as subjects and as volunteers to collect data; and that he used a "classic case of a biased sample."

A question of participation

"Frank said that only 40% of those who could have participated in the study actually did so. My question is, 'What were the other 60% doing?' Just on that alone, we could throw out his study," Kessel said.

Frank, currently a professor and chairman of the Department of Preventative Medicine and Environmental Health at the University of Kentucky College of Medicine, said in a telephone interview that his study reached no conclusions. It simply reported data and suggested, based on that data, that more research needs to be done on various subjects, according to Frank.

"The study states that this was a hypothesis-generating study," he noted. "I said at the outset that I wasn't looking to prove anything. I was looking for possible associations that needed to be followed up — that's what a hypothesis-generating study means."

Findings and problems reported

The questionnaire used in the study, according to Frank, was developed while he worked at New York's Mt. Sinai hospital in collaboration with behavioral scientists, occupational physicians and eye doctors after reviewing related literature. "Not only did I report my findings, but I reported what the potential problems of the study were."

Was there a potential for bias in the study? Replied Frank: "Because we didn't get the distribution that one would have expected — that one would have anticipated — then there is some bias. But I think our statements in the paper reflect that and that we were aware of that."

Copies of the review are available for $35 each from The Koffler Group, which can be reached at Suite 200, 3029 Wilshire Blvd., Santa Monica, Calif. 90403.

Editor of report critical of press coverage of VDT health studies

SANTA MONICA, Calif. — A report recently released here suggests that negative health and safety reports regarding VDTs have been enhanced by press coverage.

Moreover, the negative reports have been marked by poor scientific research methods, a problem compounded by the trade press, which "often treats ergonomics as a sensational issue or fad," charged the "Office Systems Ergonomics Report," edited by Karen Kessel. "Many articles contain blatant errors and misconceptions that are treated implicitly as fact and then perpetuated by decision makers, many of whom should know not to base decisions on what they read in the press."

Kessel is author of "The VDT Health Debate and the Importance of Research Methods" carried in the newsletter. She acknowledged her outspokenness on the VDT health research issue in a recent telephone interview and cited additional reports which she said support her views on VDT research.

"One study that was excellent that I did report on was done by Starr, Thomson & Shute for AT&T Bell Laboratories. Now there's the difference between good research and bad research," Kessel maintained. "These guys used appropriate controls. They were attempting to eliminate all kinds of biases, all kinds of controls that it's normally difficult to control for."

According to Kessel, the Bell study found no health differences between VDT users and "paper people," workers who do the same task as VDT users, but use traditional office equipment in their work.

Another report, by Jayne M. Schurick, Martin G. Helander and Patricia A. Billingsley of The Canyon Research Group, Inc., which examined about 64 studies done in the VDT area and is also covered in the Kessel report, also concluded that the studies were poor, according to Kessel.

"I believe that ergonomics is important. I believe that you need ergonomics. I do not believe that the problems that have been attributed to VDTs have any foundation in fact," Kessel concluded.

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**Don Heitzmann is Cullinet's Director of System Software Development. Don joined Cullinet seven years ago. His early efforts were in design and development of IDMS-DC and he is now responsible for the complete IDMS database product line. Don is a graduate of Princeton University with a B.S. in Electrical Engineering and a Masters in Architecture.*

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Appleton, WI	April 12	Detroit, MI	May 23	Phoenix, AZ	April 12
Atlanta, GA	May 15	Greenville, SC	May 24	Pittsburgh, PA	May 16
Atlantic City, NJ	May 10	Harrisburg, PA	May 8	Portland, ME	May 15
Bastercreek, MI	May 15	Hartford, CT	May 6	Quebec City, PQ	May 17
Boston, MA	May 23	Houston, TX	May 10	Richmond, VA	May 16
Boston/	May 3	Indianapolis, IN	May 8	St. Louis, MO	April 11
Danvers, MA		Jacksonville, FL	May 1	San Antonio, TX	May 16
Bridgeport/	May 22	Kansas City, MO	May 2	San Diego, CA	May 8
New Haven, CT		Los Angeles, CA	May 1	San Jose, CA	May 15
Calgary, AB	May 23	Louisville, KY	May 10	Springfield, IL	May 17
Charlotte, NC	May 10	Lubbock, TX	May 1	Toledo, OH	April 11
Cheyenne, WI	May 22	Lynchburg, VA	May 17	Toronto, ON	May 17
Chicago, IL	May 3	Miami, FL	May 17	Tulsa, OK	May 22
Cincinnati, OH	May 14	Milwaukee, WI	May 1	Valley Forge, PA	May 17
Cleveland, OH	May 24	Morristown, NJ	May 5	Waco, TX	May 15
Colorado Springs, CO	May 10	Nashville, TN	May 3	Washington, DC	May 8
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The fourth generation moves into the mainstream

An interview with Focus creator Gerald Cohen

After years of only limited acceptance, fourth-generation languages are becoming a mainstay in many large data processing installations. But the debate continues over whether they are yet efficient and powerful enough to take on the burden of high-throughput production applications.

One of the most successful fourth-generation languages is Information Builders, Inc.'s Focus. Now nine years old, Focus claims a base of more than 1,200 installations and more than 100,000 users. Last year it became the first major fourth-generation language to be ported to the IBM Personal Computer.

Information Builders President and founder Gerald Cohen has more than 20 years of experience in language design. Previously he was vice-president of Mathematica Products Group, Inc., where he designed the original Ramis language, which is now one of Focus' major competitors.

Cohen was interviewed recently at Computerworld*'s offices by CW Senior Editor/Software Paul Gillin.*

Q "Fourth-generation language" has become a buzzword. Please define it and differentiate it from "application generation."

Fourth-generation procedural and nonprocedural languages are used to generate applications rather than general procedural languages such as Cobol and PL/I. The difference is that their objective is a very large order of magnitude improvement in the speed with which a person can construct and perform a significant data processing function. I almost can't differentiate them from application generation.

Q In recent product literature, you emphasize decision support functions within Focus. Is this a change from earlier years?

I think it's a reactive circumstance. Sixty-five percent of our users are still doing traditional application development in Focus. When IBM introduced the information center, it was just an extra market for us. Only a third of our applications are in information centers.

Q Fourth-generation languages have been dogged by the image that they're not suitable for large-scale production applications. Is there any validity to that criticism?

Yes and no, but this is a moving target. What couldn't be done two years ago might be done today. But not all fourth-generation languages are the same. Some can't handle it, and that tends to tar the industry. It's not necessarily size that's the issue, sometimes it's logical complexity. We can do very complex applications and notions which are difficult to handle even in common programming languages.

It is true that computer resources are more heavily used by fourth-generation languages. But the most serious problem we find is that when users start using a fourth-generation language, they find that where previously they served 60 or 100 users, they can now service 300 users. We have sites that have 1,000 users. . . . We're working on the area of internal efficiency; that's one of our long-term goals. But the nexus of the problem is that you now have 1,000 potential users, and if they use it at the same time, you've got a dilemma. The information center generally is on another piece of hardware because of that. That's why IBM is so into [the information center concept].

Q So you're willing to pay the hardware price?

I don't think it's a significant hardware price. I contend that in many situations, a fourth-generation language is as efficient as if you wrote in another language.

You've got to recognize that most information systems have a built-in element of change. If you factor in the amount of time it takes to compile, test and link these systems vs. doing it in a changing Focus system, I'm not sure the computer resources are more. Sure, in a flat-out run we might lose that. But I'm saying the total measurement is not accurate.

Q In large installations, what sort of guidelines do you give DP management for what the end users can and cannot do?

Companies that go into new tools have to reorganize the way they go about delivering applications. Previously, they had a rule book that laid out the steps they were going to take. With the advent of tools such as Focus, these organizations are rewriting that method. They're looking, perhaps, for a quick preliminary study, followed the next day by a prototype system, followed by sample outputs, followed by sort of an evolutionary development.

These organizations also have to decide what set of tools to use for an application. If an application has a lot of change, clearly you go to the new tool. If the application is relatively static, one possibly should invest in a Cobol program.

Q For vendors such as yourself who have sold to the mainframe market for years, what impact will the personal computer have?

One of the reasons we jumped into the micro area so fast is that success sometimes is our customers' undoing. You can't service 1,000 users on one computer. The only solution is to distribute that computer power.

The trend today on micros is toward larger memory. We're going to single-user mainframes. When that happens, we want to divide the processing so you do some on each.

Q What sorts of problems does this present?

The No. 1 problem today is communication with the mainframe. It's a mess. IBM generally sets the standards in most things, but they don't set it in communications.

The major problem that has to be solved is a generalized way to communicate through either a central processor or to each other. We don't think the local-area networks are here yet, and we don't think the proper method of linking micros to mainframes is here yet.

Q What is going to be that breakthrough?

I think the breakthrough will be the setting down of a standard. Then all the vendors can concentrate on doing it better.

Q What are the relative advantages of micro-based application builders?

The micro has a degree of ease and intimacy that doesn't exist on the mainframe. The micro has really changed our perception of how we ought to be dealing with users. That lesson is influencing our mainframe development too. Since we introduced PC/Focus, we've changed the entire feel of the mainframe product to be more like a micro-based product.

Q Why has the mainframe software market been so quiet the last couple of years?

One reason is that IBM is a great dampener. They claim they're going to be in all sectors of the market. Consequently, there have been very few major product introductions in the mainframe market.

Another reason is that customers want service. In the mainframe marketplace, the entry fee is no longer just an author who writes a product. People want vertically integrated companies that will provide them with the tools and the services for using those tools.

Q Is there really any opportunity for a small company to enter the large system software market any more?

Yes, with utility-type products that don't require the support. But [with] any product that requires support, we're past the point that a start-up company is going to be in the running.

Q That gives the users a more limited choice. They're stuck with you.

Yes, but we're stuck with them also, in the sense that our major activity is in improving customer support services. In some respects, it's a great benefit to the DP organizations we deal with. They're getting stronger organizations that give them better service.

Q What kind of competition have you been encountering from application generators?

The application generators such as [Cincom Systems, Inc.'s] Mantis and [Oxford Software Corp.'s] UFO will generally be used in a CICS type of environment. The emphasis is mostly on data capture and file updating and not on the use of the data after that. We won't do that quite as well as them, but we will do not only data capture, but also a sophisticated job of reporting from that data. If your problem has a lot of logical complexity, you just can't do it in a UFO or a Mantis. We'll coexist very nicely with them.

Q What new capabilities are most often demanded by your users?

We're being pulled in several directions simultaneously. On one end, friendly facilities for the new users are being demanded.

On the other end, we're being pushed for facilities that [handle extremely exotic situations, such as how to calculate when a piece of data is missing].

NEWS

INTERNATIONAL REPORT
CW International News Network

AUSTRALIA

MILSONS POINT — Burroughs Corp. has reportedly surprised the banking industry here by beating both Hogan Systems, Inc. and Anacomp Australia, Inc. out of a plum contract with the State Bank of New South Wales. The $7 million order is said to have been won on the merits of Burroughs' Banking Information Software and the company's ability to provide its own hardware.

■

CROWS NEST — In response to McCormack & Dodge Corp.'s announcement of a real-time, on-line integrated financial system called Millennium:SDT [CW, Feb. 13], an Australian software vendor is claiming it leads McCormack & Dodge, Software International Corp. and MSA, Inc. with a system it has been selling for five years. The EDP Department Pty. Ltd. boasts three users of its real-time integrated Financial Management System (FMS), which was designed for large Burroughs Corp. systems.

■

MELBOURNE — Nixdorf Computer Pty. Ltd.'s pricing and "positive attitude" reportedly helped it beat out IBM for a significant contract here from the Roy Morgan Research Center Pty. Ltd. According to Peter Gant, senior executive at Morgan, "The Nixdorf staff was far more willing to help us," so his company ordered roughly $600,000 worth of Nixdorf Dual 8890 systems to replace its aging IBM 370 line.

■

MILSONS POINT — An Australian Department of Defense contract valued at over $1 million was awarded to Techway Pty. Ltd., the Australian distributor for Elxsi International Co. The department's Aeronautical Research Laboratory will become the first Australian user of the high-speed Elxsi multiprocessor.

BRAZIL

RIO DE JANEIRO — The Brazilian Society for Scientific Progress, comprised mainly of computer scientists and engineers, has launched a campaign to reserve the Brazilian market exclusively for Brazilian vendors. The current Department of Informatics policy in favor of market reservation is coming under debate in Congress in April, the opening of the Brazilian legislative year.

CHINA

GUANGTONG — Aihua Electronic Co. Ltd. has established a microcomputer production line to assemble and test Altos Computer Systems, Inc.'s 586 series of multiuser, multitasking 16-bit microcomputers. Aihua is the second Chinese company to import Altos systems. The first was the Shaoguan Radio Factory, which has been importing hundreds of Altos 586 kits for domestic assembly and sale.

FINLAND

HELSINKI — Nokia Data defeated some 80 foreign competitors to pull down the biggest export contract ever won by this country's information technology industry. The company's 16-bit Nokia PC microcomputer has been selected by telecommunications giant Northern Telecom, Inc. for its office automation and small business system product line, which will reportedly also include an extensive network of minicomputers and digital telephone exchanges. Production of the Nokia PC is expected to rise to 20,000 units annually, double the present level. The 16-bit Nokia PC features an Intel Corp. 80186 microprocessor and a 15-in. display screen. Northern Telecom plans initially to market the system in Europe, with emphasis on the UK and West Germany.

FRANCE

PARIS — The newly consolidated group Bull, which is comprised of CII-Honeywell Bull, Bull-Sems and Transac, has reported combined revenues of almost $1.4 billion, an increase of 21% over last year. The growth was attributed to the companies' accelerated development of distributed data processing and office automation products, which are said to be compatible with other vendors' products. Bull has a total work force of 26,000 people in some 70 countries.

JAPAN

TOKYO — Nippon Electric Co. Ltd. has announced two microprocessors slated for delivery in June. The 8-bit V20 and the 16-bit V30 are based on Cmos technology and are said to be compatible with systems based on Intel Corp. 8086 microprocessors. The products feature a dual data bus configuration, according to the vendor.

■

TOKYO — Hitachi, Ltd. has enhanced the main memory of its M-220 series of mainframes and unveiled an 8-in. 620M-byte version of its relational data base system RDB1. The M-220's main memory was extended from 8M bytes to 16M bytes by using 256K-byte random-access memory chips, according to the vendor spokesman.

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April 11 – Rochester, NY
April 12 – Syracuse, NY
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April 17 – Providence, RI
April 18 – New Haven, CT
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Report urges DP managers to aid in designing offices

By James Connolly
CW Staff

BOULDER, Colo. — Information systems managers need to play a greater role at the planning stages if the office building of the future is truly to be an "intelligent building," according to a report recently released here.

The report warned that plans for new construction and reconstruction must allow for computer-related factors such as miles of cabling, lighting that will not cause CRT screen glare, decentralized air conditioning and constantly changing office layouts.

"The Orbit Study," completed in the UK last year and reprinted here by Cross Information Co., urged that building designers consult at the earliest stages with information systems managers and make greater use of electrical and mechanical engineers.

The study of how 10 organizations used information technology focused on technology's direct impacts — such as cabling, heat and space — and the indirect impacts — for example, how information technology means flexibility in working hours and locations.

Variety of interests

"Above all, the effects of information technology vary depending on whose interests are involved," the report observed. "What suits the manager may not please the worker. What catches the fancy of the architect may not recommend itself to the ergonomist. . . . So many interests are involved that conflict is inevitable."

The report also noted that most of the technology that will have the greatest impact on office design over the next 10 years already exists and that "futuristic developments" are likely to affect only a minority of organizations.

Within 10 years, one out of three office workers could be equipped with electronic workstations, meaning there will be more equipment in the office, the report said. It added that soon the growth of support systems will leave office buildings with only 50% usable space for office workers.

It also emphasized that rapidly changing business environments will decentralize or kill many established companies and create many start-up companies, which means frequent changes will be made in office buildings' space allocation, services and interior design. Few office buildings will have a single tenant, and those companies that are sole occupants are likely to need communications capabilities with satellite offices.

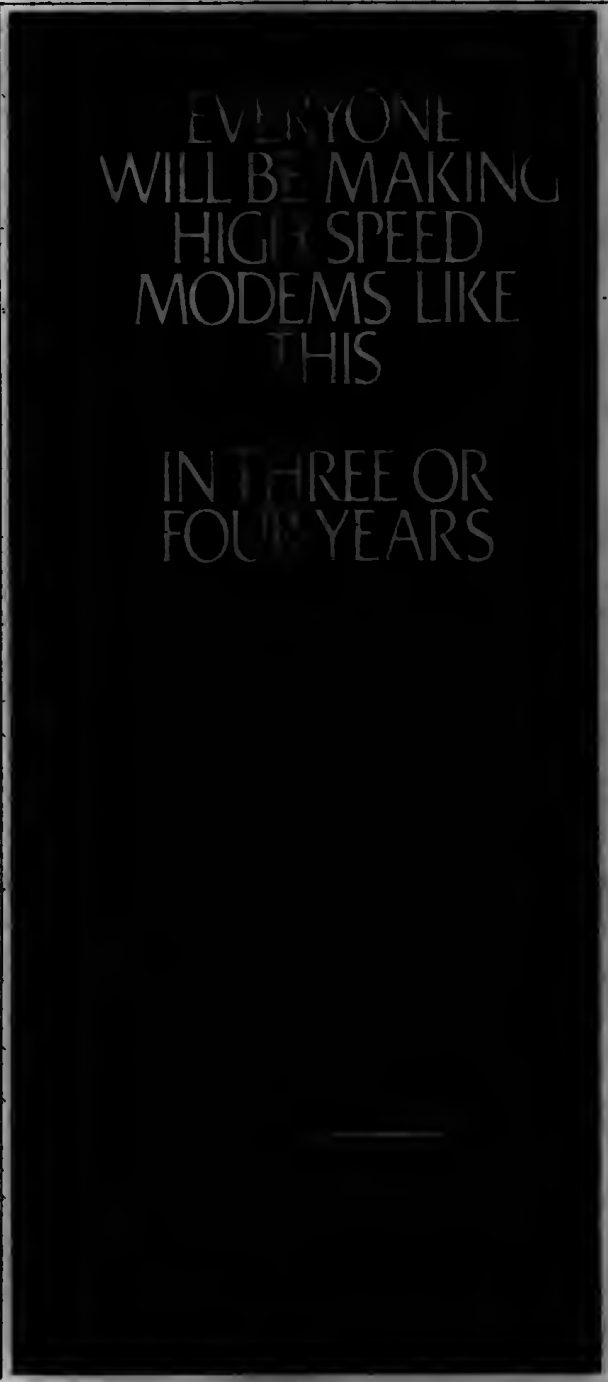
The report recommended that designers allow for cellular space allocation, rather than open offices, and increased space for support and ancillary services. Designs should also allow for dispersed rather than centralized computer rooms and the appropriate floor load levels, according to the report.

It also recommended large, dispersed vertical ducts, which would take up at least 2% of available floor area, to separate power, telephone and signal cable.

Air conditioning capacity should be expandable, which will mean greater demand for servicing access and a subsequent minimum floor-to-ceiling height of 2.8 meters.

According to the report, buildings with the ability to handle information technology will be easier to let in a tight market, while "marginal buildings" will lose their value within five years if they aren't renovated. It also said that new and refurbished buildings might be easier to market as shells, with the services and interior scenery fitted to customer specifications.

The 108-page "Orbit Summary Report" is available for $400 from Cross Information, Suite B, 934 Pearl, Boulder, Colo. 80302.



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TANDEM

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He tracks mass media's changing image of computers

By John Gallant
CW Staff

CAMBRIDGE, Mass. — Beneath the image of the computer in mass media is an underlying fear of technology and the people who control it, according to David Goodstein.

"There is a basic fear that is always reflected in visualizations of the computer in films and television. That fear is the centralization of authority in the person of the specialist who can control this fantastic tool. People who don't understand computers are afraid of them and of those who program them."

Goodstein is the director of the Technopolis Foundation, an organization devoted to researching the impact of technological change on society. The group is exploring that topic via its film series entitled *Thinking Machines: Images of the Computer in Mass Media*, at the Cambridge Institute for the Arts and Sciences here.

"Twenty years ago, when computers required almost an entire building to support them, it did not seem very likely that within our lifetimes they would become part of our mass culture," Goodstein said in a recent interview. "But the computer has come to portray technology in mass media, and technology has a bipolar image, depending on the political and economic climate. In rough times, technology is portrayed as a monster. In better times, technology is the benevolent savior."

Goodstein said computers have customarily been portrayed as massive, complex machines, usually under the power of a lone — often mad — creator or completely beyond mankind's control. The image is evident, he observed, in such films as *Alphaville* by Jean Luc Goddard, George Lucas' early work entitled *THX-1138* and Stanley Kubrick's striking *2001: A Space Odyssey*.

Another theme woven throughout early images of the computer is that of the "hacker's girlfriend." Explained Goodstein, "That's where the programmer falls in love with the computer, or the computer falls for the programmer and creates all sorts of problems. That was a perfect visualization of what computers were seen as in the 1950s and '60s. Those were the days when hackers were not yet culture heroes, and programmers were regarded as peculiar and almost a part of the machines they were so obsessed with."

'Blinking and smoking'

In their starring roles, computers have also exhibited some interesting, though not very accurate, features. "Tape drives and blinking lights are the two great images of the computer in mass media. They are the visible manifestations of computing machinery, though not really typical of most installations. These machines also could perform a number of rather specialized peripheral functions like spitting out sparks and emitting smoke."

Is the computer's image in mass media changing? Goodstein said yes, but not necessarily for the better.

"The image has become more benevolent, but not much more realistic. The computer is a standard fixture in a number of television series, like *Knight Rider* and *Automan*, where it is even portrayed as a superhero. But it's still the image of the blinking lights, and that's not how it is. People don't quite know how to portray computers because there's nothing really to look at."

The image of those who control computers has undergone a drastic revision, however. "The new theme is that of the Whiz Kids. The 1980s have made the hackers culture heroes, and we have the media to thank for that. No matter how powerful it is, IBM was never going to make heroes out of data processing people. That runs against the corporate grain."

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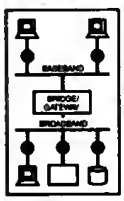

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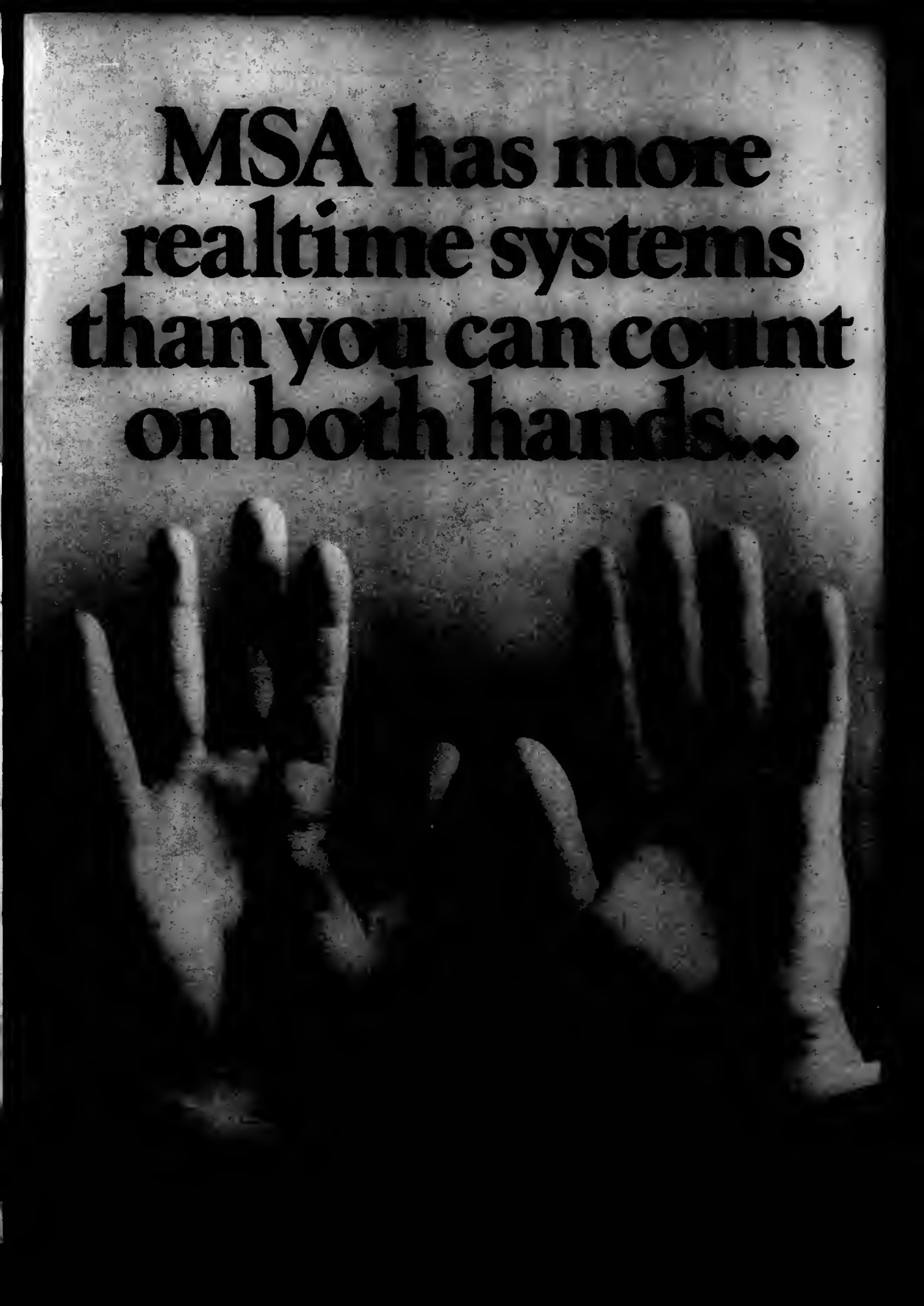

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NEWS

National Crime Prevention computer center set to open

By David Gross
CW Staff

WASHINGTON, D.C. — The National Crime Prevention Council is establishing a computerized system to help police departments, citizen groups and others seek information on crime prevention programs.

The council has enlisted the support of the U.S. Department of Justice, several private, nonprofit foundations and Digital Equipment Corp. in developing the Crime Prevention Center, which organizers say will be the first such program in the nation.

"This is absolutely a ground-breaking effort in the whole area of crime prevention," said Jean O'Neil, assistant program manager for the council. The system is scheduled to begin operating in July.

Made up of some 90 members representing local and state governments and law enforcement agencies . . . the council is probably the nation's largest repository of information about local crime prevention programs . . . It administers the [coalition's] campaign, which features a trench-coated dog named McGruff and the slogan, 'Take a Bite Out of Crime.'

Made up of some 90 members representing local and state governments, law enforcement agencies, organized labor, business and civic groups, the council is probably the nation's largest repository of information about local crime prevention programs, such as neighborhood watch, officials said. It administers the Crime Prevention Coalition's national campaign, which features a trench-coated dog named McGruff and the slogan, "Take a Bite Out of Crime."

The council has been receiving an increasing number of requests for information. "By utilizing current computer technology, the center will meet one of the most pressing needs in today's crime prevention field — the need for specific and detailed information on programs that work," said Assistant Attorney General Lois H. Herrington.

Up until now, O'Neil said, the council has relied on paper records and staff members' powers of recall to respond to requests for information. That procedure is slow and consumes too much staff time, she said.

With a computerized system, the council hopes to respond more quickly and accurately to requests for information about crime prevention programs. The data bases will be used to establish nationwide information about crime prevention programs, identify successful programs and help local groups contact promising projects in their region.

"The council is a very small organization, yet it has the potential to help a large number of people," O'Neil said. "Without these systems, we can't help these people."

Sometime in the future, she said, the data base may be made accessible through remote terminals and a dial-up communications network. An $8,600 grant from DEC was used to fund partially the purchase of DEC hardware and software. The council purchased two Decmate II business systems, including two 10M-byte Winchester disks; word processing software, an LQP02 letter-quality printer and an LP-100 dot matrix printer. The center also obtained Condor Computer Corp.'s Condor 3 data base management software.

Other private contributors to the program are the Edna McConnell Clark Foundation, the Florence V. Burden Foundation and the Hyde & Watson Foundation.

Labor department, union settle on six-month test period for robot

PITTSBURGH — A grievance filed with the Federal Labor Relations Authority was withdrawn recently after a federal agency here agreed to a union demand that it address the human side of automation.

The grievance was filed last July by Local 644 of the American Federation of Government Employees to protest the replacement of four nonunion, unskilled laboratory workers by a robot at the Labor Department's Mine Safety and Health Administration (MSHA) (CW, Nov. 28).

According to the president of the local, Richard Clougherty, the complaint charged the Labor Department with failing to inform the union that the robot would be installed and sought to secure the employment rights of the four workers, who, Clougherty claimed, had been reassigned busywork.

Bargaining table

After the complaint was filed, "management came to us," Clougherty said, and agreed to sit down at the bargaining table.

As a result, MSHA has agreed to a six-month test period for the robot, which is used to test dust samples from mines, a job that Clougherty called "dirty and terrible."

During the six-month test period, no employees will be effected.

Negotiating options

If a decision is made to keep the robot, management has agreed to negotiate with the union the future of any displaced workers.

Options include retraining and transferring workers to another government facility.

Clougherty is convinced the union won. "Our intent all along was to protect the rights of these workers, not to stop technology," he maintained.

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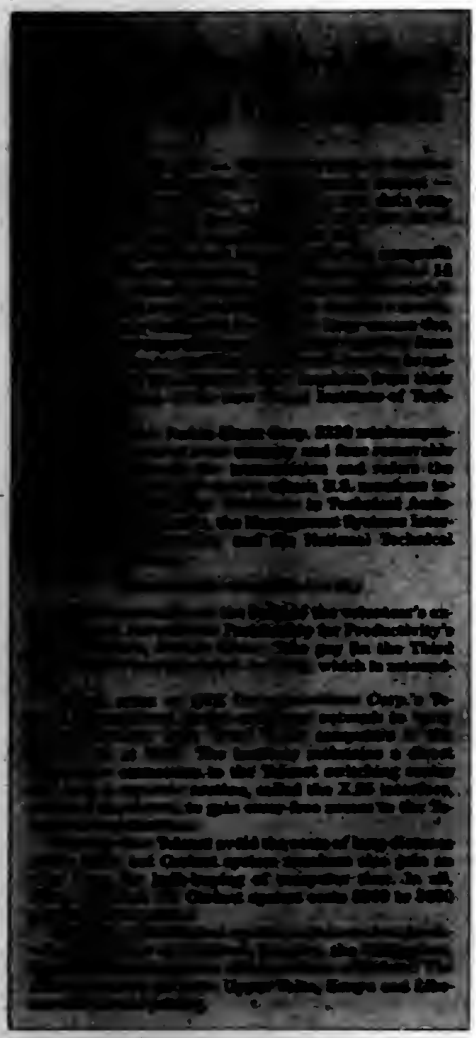

'Electronic Peace Corps' dream of Virginia author

By Edward Warner
CW Staff

If David Rothman's dream someday becomes reality, an engineer in a Third World nation could get his calculations for a hydroelectric dam checked by an expert in the U.S. — using a system that would transmit the data for about $1.

Rothman's dream is an adjunct to the U.S. Peace Corps that he calls the Electronic Peace Corps, which would link the computers of Third World nations to those of experts in the U.S. and provide referrals of Third World questions to expert volunteers in the U.S. The Electronic Peace Corps would rely on the advances taking place in international data transmission, especially packet-switching technology, but like the Peace Corps itself, its goal would be to promote Third World self-sufficiency.

Rothman, an Arlington, Va., author of computer books, said his plan for an Electronic Peace Corps arose from discussions on Third World communications with science fiction novelist Arthur C. Clarke, who is helping to organize a high-tech training center in Sri Lanka.

Rothman's ideas may not be so farfetched. Already, a 14-year-old international aid organization has begun operating a similar service, called Carinet, for 10 Third World nations, most of them in Africa (see related story).

Rothman, however, envisions the Electronic Peace Corps as a federally-funded effort, one that would give "the U.S. more bang for the buck on its foreign aid [spending]" by allowing Peace Corps workers and overseas representatives of the U.S. Agency for International Development (AID) to get accurate answers to local problems.

Using lap-size portable computers, those AID workers could link with U.S. computers to get market projections before farmers plant crops. They could also give a local doctor expert advice on a difficult case or help with the establishment of food distribution networks.

Peace Corps spokeswoman Mary Mead, however, questioned the widespread applicability of an Electronic Peace Corps in the Third World because "in a lot of those places, there isn't even electricity." But she added, "I don't mean to suggest that it's a bad idea," pointing out that the agency has taken no official position on the proposal.

Rothman, though, claimed that the elite of Third World nations — the people with whom U.S. experts would work — have access to telephones and, hence, international communications. The big need in the Third World, he said, is for small computers and, more importantly,

The Electronic Peace Corps would rely on the advances taking place in international data transmission . . . to promote Third World self-sufficiency.

the installation of packet-switching equipment, which dramatically reduces the cost of data transmission to rates as low as $1 per 1,000 words.

Right now, "the problem is the phone bill. Telex can be awfully expensive, too. And the mail takes forever," Rothman said.

As a result, he continued the doctors, engineers and planners in the Third World are reluctant to take their problem cases to the experts in the U.S. That's too bad, Rothman said, because there are many experts in the U.S. who have already shown an interest in lending their knowledge toward solving Third World problems. A nonprofit group called Volunteers in Technical Assistance has, with AID funding, gathered a group of 5,000 volunteers who offer advice on everything from communications to soap making.

A good place for the U.S. to try out an Electronic Peace Corps, Rothman said, would be Sri Lanka, where, he estimated, introduction of packet switching would cost between $20,000 and $25,000. That, he added, is roughly the price of paying and providing for two Peace Corps workers annually.

Naren Chitty, a counselor at the Sri Lankan embassy in Washington, D.C., agreed. "We applaud the concept," he said. "We don't see any electronic imperialism in it."

Chitty said he felt political considerations would not be an issue, at least for Sri Lanka, because "technology is potentially neutral." He said an Electronic Peace Corps would greatly help the educated members of his nation's work force become involved with high technology.

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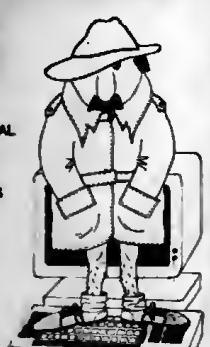

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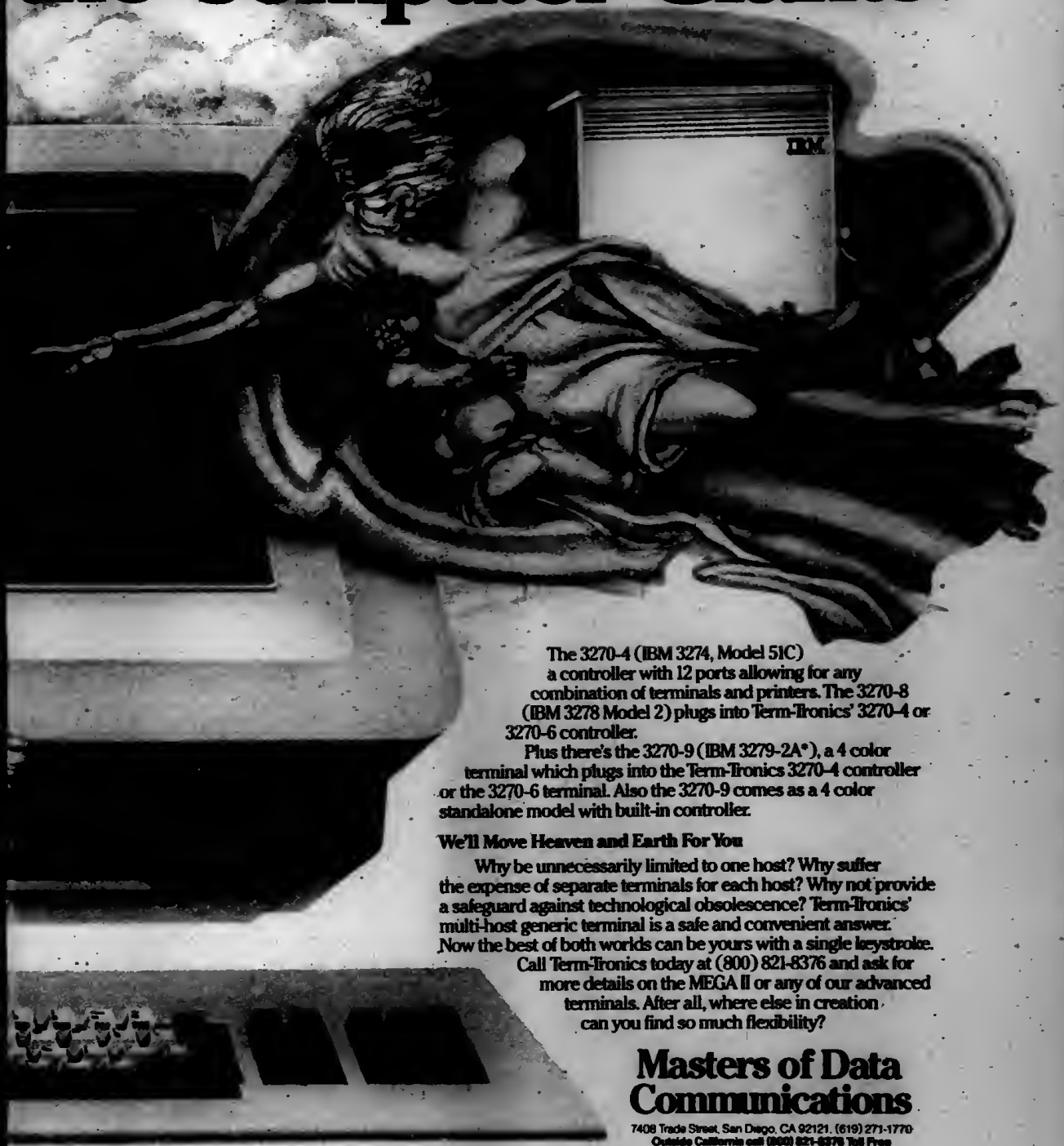

The 3270-4 (IBM 3274, Model 51C) a controller with 12 ports allowing for any combination of terminals and printers. The 3270-8 (IBM 3278 Model 2) plugs into Term-Tronics' 3270-4 or 3270-6 controller.

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Yes, SAS can handle large production applications

By Paul Gillin
CW Staff

HOLLYWOOD BEACH, Fla. — Can large-scale production applications be built using SAS Institute, Inc.'s line of SAS software products? The answer to that question is a resounding "yes," according to Judith H. Mopsik, program director at ORI, Inc. in Bethesda, Md.

Mopsik

Speaking to a large crowd at the SAS Users' Group International (Sugi '84) meeting here recently, Mopsik told how a team of seven programmers working part time built a 50,000-line application for the Bureau of Labor Statistics almost entirely in SAS. The application is an important part of the statistics used to compute the Consumer Price Index, she said.

The application took a total of two years to create, but coding, testing, integration and transition into production took only 12 months, Mopsik said.

The application is modular, maintainable and easy to modify, with changes appearing transparent to the user, she added. It includes built-in test and verification procedures, including a routine that analyzes log statements and prints out those procedures that are consuming the most CPU time. It also has facilities to produce custom reports and transaction files to update the data base, she noted.

The application was developed with heavy dependence on the system development life cycle approach, Mopsik said. SAS was used in nearly every phase of development, including requirements analysis, the writing of system specifications, systems design, program design and coding, prototyping, unit testing, system testing and documentation.

In the analysis phase, SAS was used to produce sample frequencies and statistics to present to users. "We can show users we understand what they want, and they gain confidence in us," Mopsik said.

SAS was used regularly in structured design and analysis to create process descriptions that were eventually translated into SAS procedures and data sets. "Data flow elements were later used as variables throughout the system design," Mopsik said. "Users can review the variables, and the data flow diagrams can translate easily into a systems design. We could take the data steps and the procedural steps and match them to the functional specifications."

The system had to be modular to ease updates and maintenance. Although many users do not believe SAS lends itself to modularity, Mopsik noted that "routines like subroutine calls and pass parameters can be done using the macro facility.

"Once you begin to understand the macro facility, you can begin to do many things you thought could only be done in traditional programming languages," she said.

As part of the procedure of translating systems design to programming specifications, the group formulated programming conventions. For example, a macro command was always preceded by two underscores and an array by one underscore. Every DO . . . END statement was also required to contain a comment field.

"I don't want to take anybody's creativity away, but we have to realize that this is a volatile industry, and we have to have some standards," Mopsik said. "It's better to spend your time solving the problem."

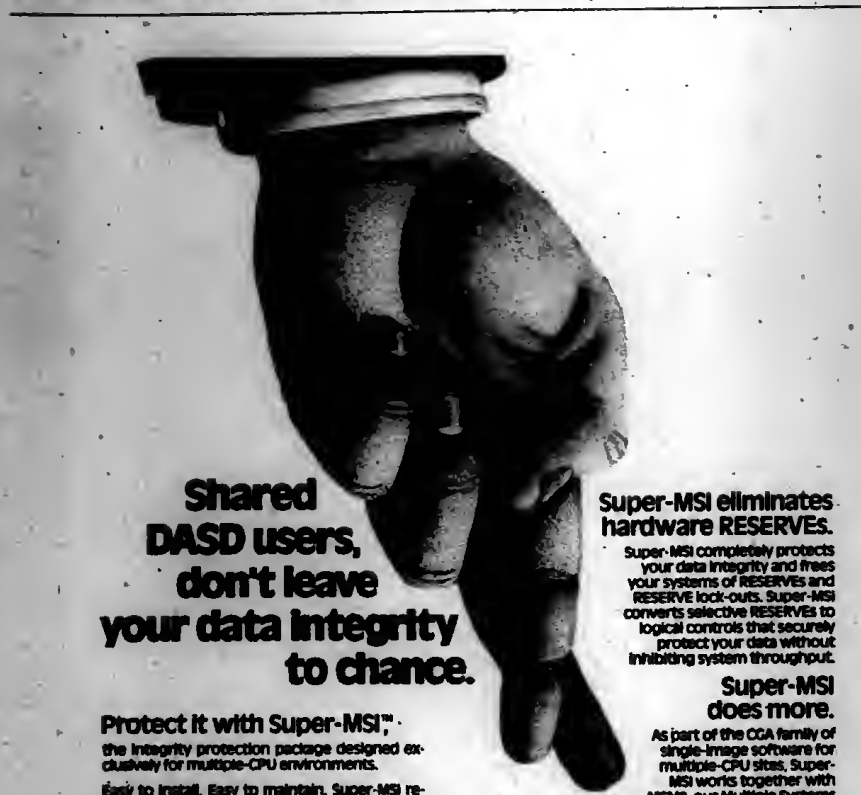
Program flowcharts were created with extensive use of structured walk-throughs and peer review to avoid duplication of coding effort. The fact that a detailed system design already existed enabled the senior programmer/analysts to turn the routine programming over to junior staff.

The group then began prototyping and benchmarking to identify potential weaknesses in the system. "An SAS prototype can be tested and coded quickly," Mopsik remarked. She said the software's "Proc" statements provide good facilities to produce interim reports and screens. "You can also easily create new variable structures because these aren't embedded in SAS."

The staff also used the "Proc" statement frequently in unit testing by embedding it in programs and conditionally printing both before and after testing. Test reports and subset selections were printed for user signoff during the test period. "As soon as you're ready to go into production, you can just go in with a text editor and delete the test prints," she said.

System testing was made easier by use of the "Proc" statements, which allowed users to verify sample reports and statistics before the code was put into production.

If the system development life cycle method is followed carefully throughout design and coding, documentation is a breeze, Mopsik commented. "You have system design and flowcharts, you automatically have usage instructions for system-level macros, and you have SAS coding conventions," she noted.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WEEK OF APRIL 15

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WEEK OF APRIL 22

APRIL 23, CHICAGO — Making the Transition from SPSS to SPSS-X. Contact: SPSS, Inc., 444 N. Michigan Ave., Chicago, Ill. 60611.

APRIL 23, NEW YORK — Introduction to the IBM PC. Contact: Center for Data Processing, Inc., Suite 402, 450 Seventh Ave., New York, N.Y. 10123.

APRIL 23, NEW YORK — Word Processing with Wordstar. Contact: Center for Advanced Data Processing, Inc., Suite 402, 450 Seventh Ave., New York, N.Y. 10123.

APRIL 23-25, NEW YORK — The Micro-Mainframe Connection. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

APRIL 23-25, BOSTON — DOS/VSE Internals, Debugging and Problems. Contact: Goal Systems International, Inc., 5455 N. High St., Columbus, Ohio 43214.

APRIL 23-25, BOSTON — SNA. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

APRIL 23-25, PHILADELPHIA — Data Analysis. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 23-25, BOSTON — Implementation of Data Base Systems. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

APRIL 23-25, ATLANTA — Communications Workshop. Contact: Advanced Technology Systems, Inc., 302 Research Drive, Norcross, Ga. 30092.

APRIL 23-26, WASHINGTON, D.C. — Software Quality Assurance: A Management Systems Approach. Contact: The George Washington University, Washington, D.C. 20052.

APRIL 23-27, LOS ANGELES — Advanced Systems Analysis. Contact: Association for Systems Management, 24587 Bagley Road, Cleveland, Ohio 44138.

APRIL 23-27, NEW YORK — CICS Internal Architecture. Contact: Syscd, One Park Ave., New York, N.Y. 10016.

APRIL 23-27, BALTIMORE — Structured Cobol. Contact: Advanced Technology Systems, Inc., 302 Research Drive, Norcross, Ga. 30092.

APRIL 23-27, LOS ANGELES — Structured Design and Structured Programming. Contact: Infosci, Inc., Box 7117, Menlo Park, Calif. 94026. Also being held April 30-May 4 in Washington, D.C.

APRIL 23-27, PHILADELPHIA — Auditing in the Contemporary Computer Environment. Contact: EDP Auditors Foundation, 373 S. Schmale Road, Carol Stream, Ill. 60187.

APRIL 23-27, ANAHEIM, CALIF. — Structured Analysis and Design Workshop. Contact: Yourdon, Inc., 1133 Ave. of the Americas, New York, N.Y. 10036. Also being held April 23-27 in Boston and Louisville, Ky.

APRIL 23-27, WASHINGTON, D.C. — Unix for the DP Professional. Contact: Wabco Industries, Inc., P.O. Box 18505, 3513 Washington Ave., Alexandria, Va. 22309.

APRIL 23-27, WASHINGTON, D.C. — Structured Design Workshop. Contact: Yourdon, Inc., 1133 Ave. of the Americas, New York, N.Y. 10036.

APRIL 23-27, OAKBROOK, CALIF. — DBS Systems Management. Contact: Institute for Software Engineering, 510 Oakmead Pkwy., Sunnyvale, Calif. 94086.

APRIL 23-27, KANSAS CITY, MO. — Structured Program Design/Maintenance. Contact: Georganna Carson, Ken Orr and Associates, Inc., 1725 Gage Blvd., Topeka, Kan. 66604.

APRIL 23-27, HOUSTON — Structured Analysis and Design Techniques: Contact: Learmonth & Burchett Management Systems, Inc., Suite 405, 2800 N. Loop W., Houston, Texas 77092.

APRIL 23-27, ATLANTA — Systems Workshop II. Contact: Ware Associates, 38 Main St., Hudson, Mass. 01749.

APRIL 23-27, TORONTO — Systems Analysis. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 23-27, NEW YORK — Structured Programming Workshop. Contact: Yourdon, Inc., 1133 Ave. of the Americas, New York, N.Y. 10036.

APRIL 23-27, BOSTON — CICS Command Level. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 24, BOSTON — Computer Basics for Non-computer People. Contact: The American Center, P.O. Box 21179, Sarasota, Fla. 33583. Also being held April 25 in Providence, R.I.

APRIL 24, NEW YORK — Spreadsheets Using Lotus 1-2-3. Contact: Center for Advanced Data Processing, Inc., Suite 402, 450 Seventh Ave., New York, N.Y. 10123. Also being held April 25 in New York.

APRIL 24, CHICAGO — Report Writing With SPSS-X. Contact: SPSS, Inc., 444 N. Michigan Ave., Chicago, Ill. 60611.

APRIL 24, NEW YORK — Advanced Wordstar (Spellstar and Mail/Merge). Contact: Center for Advanced Data Processing, Inc., Suite 402, 450 Seventh Ave., New York, N.Y. 10123.

APRIL 24-25, NEW YORK — Comped Career Conference for Data Processing Professionals. Contact: Comped Technical Corp., Inc., 10 E. 21st St., New York, N.Y. 10010.

APRIL 24-25, SAN FRANCISCO — Personal Computers/Software. Contact: The Yankee Group, 89 Broad St., Boston, Mass. 02110.

APRIL 24-25, NEW YORK — International Communications Products, Technology and Regulation. Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

APRIL 24-25, WASHINGTON, D.C. — The Second Telecommunications Pricing Institute: After Divestiture. Contact: Executive Enterprises, Inc., 33 W. 60th St., New York, N.Y. 10023.

APRIL 24-25, BOSTON — DP Documentation. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 24-26, BERKELEY, CALIF. — Microprocessor Background for Management Personnel. Contact: Public Information Office, University Extension, University of California Berkeley, 2223 Fulton St., Berkeley, Calif. 94720.

APRIL 24-26, BOSTON — Data Communications Concepts. Contact: Suzane Gallart, Memorex Customer Education, M/S 03-16, 3393 Octavius Drive, Santa Clara, Calif. 95051.

APRIL 24-26, PHILADELPHIA — Screen Design. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 24-26, TEANECK, N.J. — Data Communications Concepts. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 24-27, WASHINGTON, D.C. — National Data Base and the Fourth-Generation Language Symposium. Contact: Digital Consulting Associates, 339 Salem St., Wakefield, Mass. 01880.

APRIL 24-27, WASHINGTON, D.C. — Hands-On Unix Workshop. Contact: Integrated Computer Systems, P.O. Box 45405, 6305 Arizona Place, Los Angeles, Calif. 90045.

APRIL 24-27, TOKYO — Computer Graphics Tokyo 1984. Contact: Executive Travel, MSP, Inc., Suite 22, 1801 E. 79th St., Bloomington, Minn. 55420.

APRIL 24-27, WASHINGTON, D.C. — Hands-On Microprocessor Workshop. Contact: Integrated Computer Systems, P.O. Box 45405, 6305 Arizona Place, Los Angeles, Calif. 90045.

APRIL 24-27, WASHINGTON, D.C. — Microprocessor Software, Hardware and Interfacing. Contact: Integrated Computer Systems, P.O. Box 45405, 6305 Arizona Place, Los Angeles, Calif. 90045.

APRIL 25, WELLESLEY, MASS. — Computer Crime Detection and Prevention. Contact: Dr. Sanford Sherizen, Data Security Systems, Inc., 5 Keane Terrace, Natick, Mass. 01760.

APRIL 25, NEW YORK — Introduction to Dbase II. Contact: Center for Advanced Data Processing, Inc., Suite 402, 450 Seventh Ave., New York, N.Y. 10123.

APRIL 25-26, CHICAGO — Financial Analysis for Telecommunications Equipment Acquisition. Contact: Business Communications Review, 950 York Road, Hinsdale, Ill. 60521.

APRIL 26-27, PHILADELPHIA — Data Base Design. Contact: QED Information Sciences, Inc., QED Plaza, P.O. Box 181, Wellesley, Mass. 02181.

APRIL 27, NEW YORK — PC Communications. Contact: Center for Advanced Professional Education, Suite 110, 1220 E. Garry St., Santa Ana, Calif. 92705.

EDITORIAL

AT&T move leaves questions

AT&T may have answered some questions on Wall Street with its announcement last week of a range of processing and communications products. But the presentation did little to answer the big question: Does the telecommunications giant have the capabilities to become a major player in the data processing equipment market?

In some respects, the unveiling of AT&T's products was impressive. In other respects, however, it left many doubts that AT&T, with one wing free of the shackles of government regulation, can duplicate IBM's dynamic technological and marketing strides.

Not surprisingly, AT&T's lineup seems to offer the most potential in the area of communications. The offering of its Unix V operating system on each product level, from the low-end to the high-end, provides possibilities for efficient and less expensive uploading and downloading among various products. Similarly, the reported ability to interface Microsoft, Inc. MS-DOS-based microcomputers to the AT&T 382/300 supermicro — and, one would assume, to other AT&T products down the road — must be attractive to decision makers who have invested capital in the IBM Personal Computer and look-alikes.

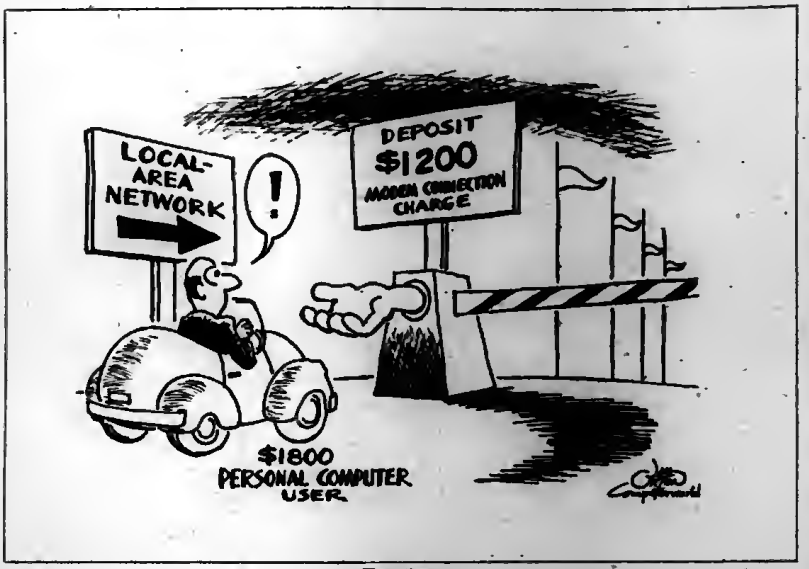
On the other hand, the DP world is probably going to be quite underwhelmed by AT&T's offerings in the supermini arena. There is little that appears to be technologically new, or even slightly advanced, among AT&T's superminis. It's questionable whether the world needs another imitator of Digital Equipment Corp., which itself is expected momentarily to announce a new high-end product.

Then there is the question of a viable line of mainframe products. Will AT&T enter this still very crucial equipment area, or has it instead drawn a line over which it will not step? To compete effectively against IBM, there are those who believe AT&T has to enter the mainframe market and complete its product hierarchy.

Another area of concern is that AT&T appears to have opted in great measure for the value-added remarketer route to bring its superminis to the market, for the time being, anyway. That's fine for addressing vertical markets, but it hardly has an immediate impact on the general-purpose computing market. This route ignores the question of whether AT&T can actually compete with IBM's renowned marketing forces on DP turf.

AT&T's 382/300 supermicro is an attractive product and stirs interest in future micro offerings. But it's just a matter of time before a flood of multiuser, supermicro/mini offerings appears from many vendors.

It almost seems that AT&T's strategy is one of depending on the acceptance of Unix to drive acceptance of AT&T hardware. Given the extent of interest in Unix at the present time, that may be a good strategy, but it would also seem to be a strategy with some risks — unless AT&T comes up with a potent hardware strategy or networking breakthrough to carry Unix to further heights.



The sting

LETTERS

Yes, Cbema may be biased, but it's in support of open trade

I agree with Charles P. Lecht's comments in his article "U.S. computer industry: 1984" [CW, Jan. 9] that reducing electronics trade with Japan would have severe and negative consequences for both the consumer and technological advances. Unfortunately, he identifies the Computer and Business Equipment Manufacturers Association (Cbema) as being in favor of trade restrictions.

Nothing could be further from the truth. Our long record of support for "free trade" measures stands as our clear defense. We may, as Lecht charges, be "biased," but it's in support of open trade, including imports of goods from Japanese companies, many of whose subsidiaries are our members. We're certainly not opposed.

Vico E. Henriques
President
Cbema
Washington, D.C.

Understanding all the hoopla surrounding CRT-related hazards

Having been in data processing for many years and utilizing CRTs for many hours at a time, I never paid very much attention to the hoopla about CRT-related hazards and ill effects. I had never had any problems. Of course, when I think of it now, I never spent more than a few hours at each sitting.

Recently, my partner and I were developing a computer-based training course for a client. We started spending eight to 15 hours straight, inputting and testing the course. After just a few days of this rigorous schedule, we began experiencing backaches and eyestrain.

Now I pay attention to all the articles on VDT use.

Kathy Tolhen
Educational consultant
Educational Horizons, Inc.
Dallas, Texas

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VIEWPOINT

'The Federation': Year Two

LASCHT ON COMPUTERS
Charles P. Lecht

"Call me a techno-romantic, a sci-fi nut, but I found myself thinking that, by Jupiter, there I was attending the first meeting of 'The Federation' as it would be instantly recognized by 'trekkies' everywhere" — "The Federation': Year One" (CW, Sept. 19).

It wasn't easy to get to Salishan Lodge in Glenneden, Ore., on Monday, March 12. For one thing, airplane traffic throughout the country was disrupted by wintry storms. Devil-may-care comments from fatalistic passengers on the final approach to Portland, Ore., betrayed the strain of those who flew across America to get there; overemotional reunions with luggage confirmed it. In comparison, the subsequent drive of some hundred miles along a blustery coastline at night to reach Salishan seemed an anticlimactic, almost ethereal, experience.

You get the idea: One really had to love science to justify going to the Oregonian winter hinterlands to join a hundred-plus blustery American and foreign scientists attending a conference titled "Experiences in Applying Parallel Processors to Scientific Computation" — everyone there did.

Organized by two of our nation's leading scientific research centers, Los Alamos National Laboratory (LANL) and Lawrence Livermore National Laboratories (LLNL), both under the U.S. Department of Energy, the conference was opened by Bill Buzbee of LANL, who exercised flawless leadership in corralling its attendees into the hall before 8 a.m. for Tuesday's opener (Buzbee's a Ph.D. mathematician/scientist from Rising Star, Texas, where corrallin' comes more naturally than talkin').

Buzbee was helped by George Michael of LLNL, whose spirited enthusiasm for supercomputer happenings derives from long and wizened experience in their development and usage.

These supercomputer superstars and their colleagues deserve our praise and admiration for the diligent and serious (but definitely not humorless) manner they exhibited in attending to the conference agenda: No one sloughed off.

The conference's attendees included scientists representing such prestigious government organizations as Sandia, the National Aeronautics and Space Administration and the U.S. Ballistic Research Laboratory; prominent high-technology companies such as IBM, Cray Research, Inc., Control Data Corp., Microelectronics Computer Co., Intel Corp., Goodyear Research, Fairchild Camera & Instrument Corp., Denelcor, Star and Elexi; universities like the University of Oregon, New York University, the University of California, University of Illinois, Stanford University, Cornell University and University of Michigan; and foreign organizations such as Fujitsu Ltd., Nippon Electric Corp., the European Center for Medium Range Forecasts and so on. Even the White House and *Scientific American* were represented.

Megaflopsniks, megaflopsniks

The conference provided an opportunity for our supercomputer scientists, whom I call megaflopsniks and megaliposniks, to share their experiences in making and using the most powerful scientific calculating and decision-making devices known to man. (A megaflops is a million floating point operations per second; a megalips is a million logical inferences per second.) Newly emerging systems are producing gigaflops and gigalips (a billion floating point operations per second and a billion logical inferences per second, respectively) speeds, although no one has reached 10 billion yet, and almost all now operate in the mega range.

You might naturally wonder why in the world anyone would need to do, say, 10 billion operations per second — that's roughly equivalent to the rate we would achieve if all the people on Earth operated desk calculators at 2½ calculations per second (floating point, to boot).

Since some calculations on even 10 gigaflops machines may take hours, for example, in computing meteorological forecasts, the idea of the entire world's population thusly consumed to achieve the same results only begins to suggest the magnitude of computation in just one system to which we aspire. Many are required to solve the scores of problems facing our megaflopsniks and megaliposniks as they apply their skills in fields like meteorology, genetics, nuclear, space, robotics, you name it, all problems of very practical consequence to us all. Let's face it: Massive problems require powerful computers for their solutions and powerful brains of the human variety, too.

While there was no shortage of the latter at Salishan Lodge, the very fact of our convening was in itself testimony to a serious shortage in computer systems powerful enough to carry out the vital computations we must perform to handle the problems facing our scientists. The conference explored how to get more power from our largest scientific research systems, such as Cray Research's Cray X-MP, by creating networked clusters of these to work on a single problem by attacking its constituent parts in parallel to obtain results faster and/or otherwise unobtainable by a single processor.

Concept of granularity

To help provide us with the impression that we can begin to understand why so many computations must be performed in finding the solutions to the problems addressed by these scientists, I offer the concept of granularity as it relates to perception in our physical world. The supercomputer is, thus, not unlike our vision-aiding micro/telescope in bringing the otherwise unseeable into focus. The finer the granularity of the lens, the more effective our instruments become. And the finer we subdivide their spatial targets, learning all we can about each subdivision, the more we know of the whole.

So may we conceptually apply granularity in our supercomputer world. For better focus of our "supertool's" powers in piercing the unknown, we subdivide its problem-space into grids of ever-diminishing unit size to learn all we can about each. Overriding in our motivation to do this is our quest for temporal stability and completeness of formulas — both essential to obtaining results in any experiment. Unfortunately, subdividing a space into ever-smaller units and computing the same amount of data for each creates exponentially growing and, ultimately, massive volumes of data.

The formulas being dealt with frequently address problems in which almost infinitesimal changes in time may bring about the need for the formulas' nearest reconstitutions. The degree to which these mathematical equations can remain stable over time — in application to a particular physical situation — brings tremendous returns in almost all aspects of problem solving: speed, easier mathematics and so on. This kind of "divide to

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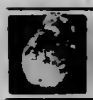
Eulogy for a defunct systems firm



HUMAN CONNECTION
Jack Stone

The following ran several days in *The Washington Post* classified pages under "Auctions": "To satisfy the creditors of the bankrupt Balance Computers organization, an auction will be held to sell off its assets . . . including a wide range of personal computers, software and accessories."

Pupil: Why didn't Balance make it? On appearances, at least, it had everything going its way, offering a variety of personal systems at the retail level plus what was reputed to be fairly decent staff support. Although it had some branch offices, it seemed to be expanding in a sensible way.

Master: In analyzing business failures, you must always remember that the real reasons may be those far afield from what you might think, reasons such as personality clashes, reneges by investors, criminality and so on, none of which we are aware of in this case.

But if history is any guide, we can presume that the classic retailing problem developed at Balance, wherein the cost of sales greatly exceeded projected product and service revenues, whereupon cash flow problems developed, and creditors pressured the company into liquidation.

Pupil: Then why doesn't IBM have difficulties in its retail operations? Everybody knows it has enormous overhead, especially very well-paid staffs in both its development and marketing facilities. Doesn't it have the same kind of problems?

Master: Ah, you have fallen into the trap of drawing conclusions on surface appearances and not delving into all the available facts. Indeed, IBM advertises at the retail level, and, of course, IBM operates its own product centers. But because of IBM's policy shifts for the Personal Computer product line — divulging technology secrets to software developers and selling its machines to other retailers at a discount — it should be more properly characterized as a hardware wholesaler than as a retailer.

As a first consequence, its costs of software development are relatively small compared with manufacturers who have built their own in-house staffs. In fact, IBM's staff does very little original Personal Computer software development; instead, it functions primarily as a software systems tester who selects, validates and assures standards conformity of the best software products around.

As a second consequence, and perhaps even more important, the bulk of the Personal Computer marketing costs is borne by the independent retailers who service the public, which I define to be home users and small business customers. You must also appreciate that the vast majority of the sales of IBM Personal Computers are made by IBM salesmen in their traditional marketplace: large organizations, such as the Fortune 5,000, educational institutions and government agencies, who typically buy in large, sometimes extravagant, quantities. In conclusion, IBM's overall cost of sales of IBM Personal Computers are made by IBM retail sales price is fairly low when compared with the independent retailer who services accounts that buy in small quantities.

In other words, when measured in terms of profitability, the major market for Personal Computers at the current time and in the near term is in the large organizations, where it has traditionally been for the computer industry.

In contrast, retailing computers — or any product for that matter — to the public results in a much narrower profit margin. Therefore, a national firm with an established business base and many branch offices that offers a broad range of products probably has the best chance of success in this marketplace, although there is always room for newcomers with a better retailing idea and the wherewithal to follow through with it. Obviously, Balance management thought it had such an idea, but the business didn't work out the way they planned it.

VIEWPOINT

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conquer" approach to providing, say, the forces at any point in time, at any location in a medium caused by explosive, aerodynamic, mutative growth and other such change presents us with the need for massive memories to contain the data for deeply subdivided media and, of course, massively powerful processing equipment to handle it.

By cleverly organizing the mathematical equations and decision-making processes that relate to the proper solution of these equations so that parts may be worked on by one or more uniprocessors in parallel (that is, simultaneously), it has been found that for just about all classes of problems, computations so executed provide us with resultant power that is greater than that represented by the simple addition of the individual powers of the parallel processor's constituent parts.

On the surface, this presents us with the paradox of the whole being greater than the sum of its parts; organization, of course, makes the difference. Employing parallelism in doing anything gets it done faster.

Yet another type of organization is of importance, too. There seems to be power multiplying relationships between the physical form of these electrical/metallurgical/chemical devices and the manner and form of the mathematical expression of the problems they are to solve.

It is easy to relate arrays of processors to matrices perhaps, but what about polynomial equations that are worked on by clusters of processors whose physical organization literally portrays an embodiment of the topological forms of such equations, as if these were being written in a new, weird script by giants from whose pens flow equations in media composed of transistors, capacitors, circuits, boards, steel and cable.

This is the first in a three-part series.

Lecht is chairman of Lecht Sciences, Inc., a New York-based think tank specializing in computer and communications technologies.

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LETTER

What about those who didn't comment?

While reading Ken Meyer's In Depth article, "A report from Vienna: Which way Cobol?" [CW, March 12], I was stirred to action by the comments attributed to Jerry Garfunkel, noted lecturer and educator on Cobol and other languages.

Garfunkel wants us to believe that since 100,000 people didn't oppose the draft standard, that they must agree. Perhaps he would also have us believe that since 100,000 drunk drivers didn't have accidents, drinking and driving are a good mix.

I'm also struck by the thought that a draft standard that gets just slightly more than 6% of comments in favor should be on very shaky ground. What about the 100,000 who didn't submit comments? I didn't submit any comments. I've been involved with Cobol as a user for most of Cobol's life, starting with the 1401 implementation of the language and its two-hour or longer compiles. I served a few years on Codasyl on what was then called the "Programming Language Committee." At the time that Ansi-74 was out for comments, I wrote most of the comments submitted by Burroughs Corp. Like most other comments, they were ignored.

Of the 100,000, many didn't think comments would be taken seriously; most are unaware of the contents of the draft standard; and very few would know where to send comments. Now that's a breeding ground for apathy.

I firmly believe in the necessity of growth and progress for the continued life of Cobol. Without such progress, we'd still have "PICTORIAL" and "IF condition AND ALSO IF condition . . ." Unfortunately, Ansi "standards" have included untried syntax and semantics and omitted some excellent language concepts because Codasyl wears blinders.

The 100,000 did not vote "yes" any more than the seven abstentions in the article voted "no."

Chris Coddington
Sandy, Utah

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SOFTWARE & SERVICES

Firm tries SAS/OR in R&D conversion project

FIRST USER

By Paul Gillin
CW Staff

HOLLYWOOD BEACH, Fla. — A company that relies heavily on research and development for its competitive edge cannot afford to waste time on projects that may take years to turn a profit.

With that in mind, Ciba-Geigy Corp. recently undertook a project to convert its 10-year-old, Fortran-based R&D planning model running in batch to something that was interactive, easier to modify and maintain and able to produce more flexible output.

In so doing, the company became the first user of SAS Institute, Inc.'s SAS/Operations Research (SAS/OR), a product that uses linear programming and Critical Path Method procedures to schedule activities that make up a project life cycle. Ciba-Geigy already employed most of the SAS product line, and SAS/OR seemed ideal for the application, according to Patricia Hermes of the operations research department in management services.

Interviewed here last week during the SAS Users Group International (Sugi '84) meeting, Hermes said she is using SAS/OR to build a model that will use Critical Path Method to model life cycles and project their profitability. The project won't be completed until later this year, but Hermes said initial indications are that development will proceed smoothly.

The application will be used by a small

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■ Tandem Computers, Inc. and MIS Information Systems, Inc. join forces to market software for Non Stop processors/46

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Avatar TC3278 gets micro-to-mainframe link ability

HOPKINTON, Mass. — Avatar Technologies, Inc. has enhanced its TC3278 Terminal Converter to provide microcomputer-to-mainframe link capabilities.

The additional software reportedly gives the TC3278 micro-mainframe file transfer capabilities in IBM CMS, TSO and CICS environments using DOS/MV, OS/MVS or VM/370 operating systems. IBM files are accessible to all TC3278 units as a shared data base, providing users with shared data resources through the existing IBM 3270 terminal network without the installation of a local-area network.

The TC3278, which connects coaxially between the terminal and the IBM 3274/76 cluster controller, offers both a nonintrusive line mode, allowing direct connection to the host, and a local mode for file transfer, personal computing and software terminal connection to the host. Connected to the cluster controller, the TC3278 is compatible with IBM Binary Synchronous Communications and Systems Network Architecture/Synchronous Data Link Control environments.

Included are Basic; Microsoft, Inc.'s MS-DOS; Digital Research, Inc.'s CP/M; Micropro International Corp.'s Wordstar; Sorcim Corp.'s Supercalc; and other utilities, the vendor said.

Prices for the file transfer software are a one-time charge of $500 for the IBM host environment and $200 for software for each TC3278 from Avatar, 99 South St., Hopkinton, Mass. 01748.

Steps to take in designing a subject data base

SOFTLINE
William H. Inmon

In this second part of a two-part series, William Inmon discusses special steps that must be taken in designing a subject data base for a decision support environment.

Although availability and performance are worthwhile objectives in the decision-support environment, they are not the issues that they are in the operational environment. Instead, the issues in the decision support environment are the consistency of data, the applicability of data and the refinement and replacement of data.

The consistency of data in the subject data base environment becomes an issue because it is common to extract data from subject data bases, refine and analyze the data and then combine the data with other data bases. Then the data may be extracted again, reanalyzed and so forth. After two or three generations of extraction and analysis, the relation of the data to the subject data base begins to be clouded.

This ambiguity can be minimized by extracting data only from the subject data base. Second- and third-generation (and thereafter) extractions are not allowed. They must be directly derived from the subject data base.

Data applicability

Data applicability within subject data bases occurs when a subject data base exists, but is unable to be related to other subject data bases or to be used for more than limited purposes.

As an example, an accounts subject data base exists, but is unable to be

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SAS User Feedback Award winner takes activist stance

HOLLYWOOD BEACH, Fla. — Valued user or nitpicker? H. Mark Bercov says he is both. A senior systems analyst at Gulf Canada, Ltd. in Calgary, Alberta, Bercov has probably called SAS Institute, Inc. 100 times in the last year to suggest enhancements or to ask questions about SAS products. Such persistence earned him the SAS User Feedback Award presented recently at the SAS Users Group International (Sugi '84) conference held here recently.

Bercov is responsible for SAS support for the DP department and about 200 users at Gulf Canada. He also codes SAS programs primarily in the engineering and planning section of the department. Bercov's activity as a SAS user emerged in part from a disagreement with company policy. The company uses a variety of software productivity products including SAS; Inseo, Inc.'s Tell-a-graf and Disepia; and Information Builders, Inc.'s Focus product.

"I think we're making a mistake because we're asking users and developers to learn several protocols and conventions," he said. "I think the company should standardize on one product, and my choice is SAS."

As reasons, he cited SAS's "moderately good" graphics and data storage capabilities and "very good" data manipulation and full screen features. He added that SAS is also "relatively bug free, and that's very important to the end user."

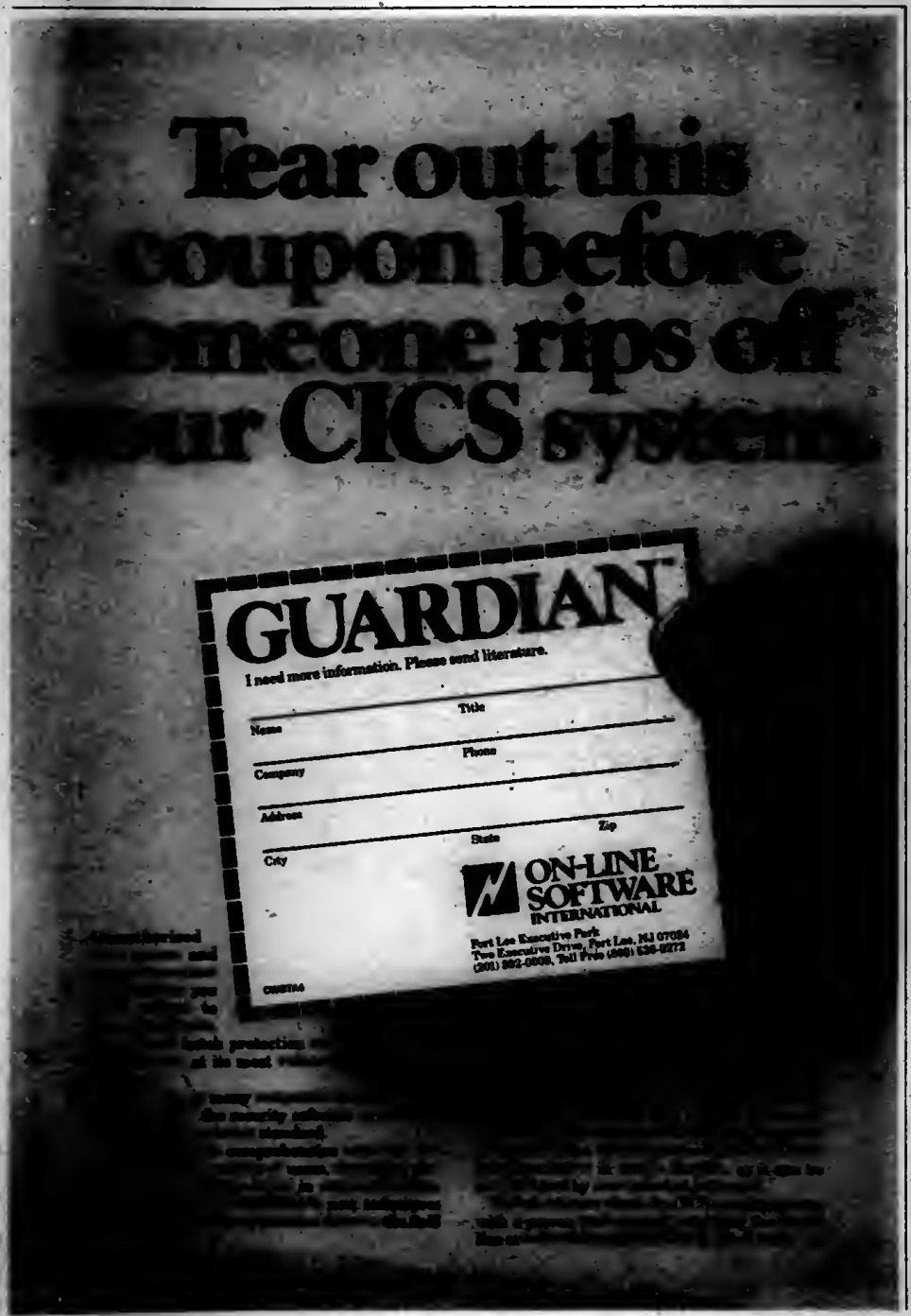
In light of his faith in the product, Bercov commented that "we as users have a responsibility to attempt to communicate what we want done with the product and where it's weak." In that capacity, he acts as a funnel for suggestions from users to the institute. Among the suggestions he submitted in the past year were a request for multiple graphs on a page in SAS/Graph and procedures for saving macro facilities before log off. "I use my judgment, of course," Bercov noted. "Some users have asked for a full inverted list data base in SAS. In general, I don't ask for things that are ridiculous."

'Stubborn perfectionist'

However, Bercov does characterize himself as "a nitpicker, a stubborn perfectionist." In previous jobs, he has been equally active in voicing complaints and suggestions to vendors. Some vendors, like Honeywell, Inc., have been receptive to his comments, while others, like Digital Equipment Corp., have been less responsive. SAS, he said, accepts his frequent calls with a good-natured protest. He added that SAS has implemented more of his suggestions than any other vendor.

But Bercov admitted that he is unusual in his activism. "People responsible for other products in the shop don't feel the same way I do," he said. He wishes more users were as vocal. "You have to have the guts to write a letter or telephone the company," he said. "I'm quite confident they'll receive suggestions very well."

Bercov pointed out that a user can't expect to make enlightened recommendations all the time. "I make a bunch of dumb suggestions, but that doesn't upset me," he said. Asked if he ever worried about becoming a nuisance, he responded, "I don't worry about being a pain. That's SAS' problem, not mine."



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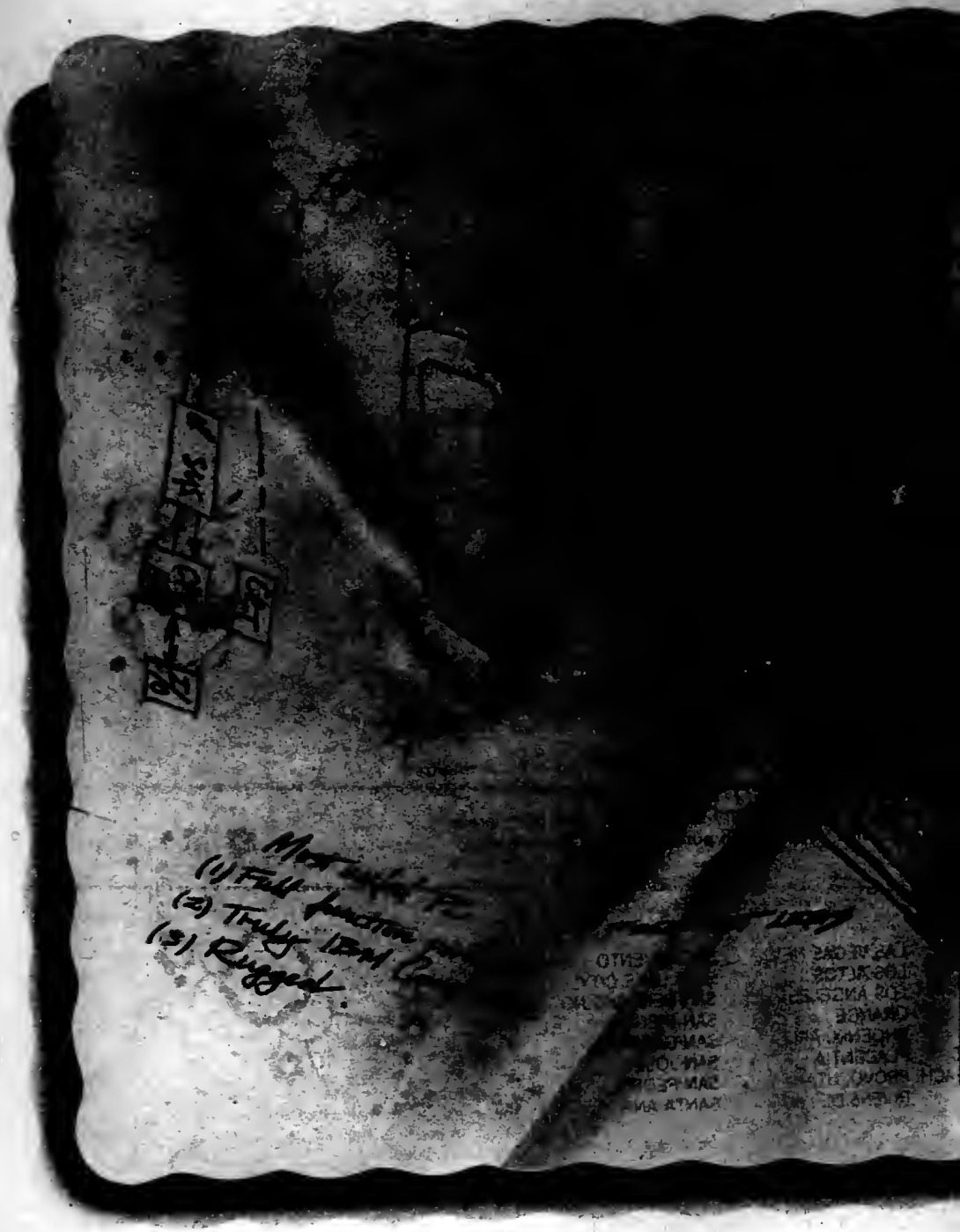

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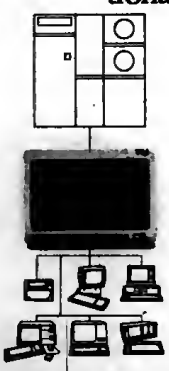

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Of course, if you're undecided about what to do you can always ask for a show of hands...

intel

** According to the Gartner Group, who took the time to figure out all the hidden costs, each direct pc-to-mainframe connection costs approximately $22,000. Each * Xenix and Multiplan are trademarks of Microsoft Corporation. © 1984 Intel Corporation.*

Tandem, MIS Information Systems sign market pact

CUPERTINO, Calif. — Tandem Computers, Inc. and Santa Clara, Calif.-based MIS Information Systems, Inc. have announced an agreement to market jointly the MIS Batch software system.

Under the terms of the agreement, a Tandem spokeswoman said, MIS Information Systems will license MIS Batch directly to Tandem Non Stop superminicomputer users and will provide support and service for the system.

MIS Batch reportedly schedules and manages the execution of batch-oriented programs on Non Stop systems.

The software is said to operate in a fault-tolerant mode to assure reliable execution of tasks on a single Non Stop processor or across networks of Non Stop systems. MIS Batch reportedly also allows users to display the status of all batch jobs in process, and it provides a complete log of activities.

The package is also said to share system resources with on-line transaction processing applications as required.

MIS Batch is compatible with existing applications that run under Tandem Non Stop system software products, the spokeswoman said. MIS Batch licenses for $18,000 for the first system and $9,300 for each additional system.

More information is available from Tandem Computers, 19333 Vallco Pkwy., Cupertino, Calif. 95014.

SYSTEMS SOFTWARE

COMPUTER ASSOCIATES INTERNATIONAL, INC.
CA-Jasper/JA Release 2.1

Computer Associates International, Inc. has introduced an enhanced version of its performance evaluation software that reportedly includes more than 100 new reports on system activity, utilization and performance for IBM OS/MVS installations.

CA-Jasper/JA Release 2.1 features more than 120 reports covering computer performance and utilization, the vendor said. In addition, 27 trend graphs are provided on a monthly basis for planning purposes. The graphs give an historical view of the past year and an automatic projection for the next six months for areas such as work load turnaround time, idle time, paging rate and TSO usage.

Regular monthly reports include system summary graphs, typical job profiles, significant changes, TSO summaries, printer forms usage, job class summaries, disk utilization graphs, tape utilization graphs, system trends and production summary graphs.

A three-year lease for CA-Jasper/JA Release 2.1 is priced at $17,000.

Computer Associates International, 125 Jericho Tnpk., Jericho, N.Y. 11753.

AUTOVATIVE COMPUTER EXTENSIONS, INC.
Graphics printing support

Autovative Computer Extensions, Inc. has announced the addition of IBM 3287 graphics printer support to its ACX-PM Printer Manager for IBM's VM/SP operating system.

Users of SAS Institute, Inc.'s SAS/Graph Release 79.6 or higher and IBM's Graphical Data Display Manager can spool and manage graphics output as well as text output through the added graphics printing support, a vendor spokesman said. According to the vendor, users can set and alter spool file characteristics and purge, forward space and back space print files.

ACX-PM Printer Manager requires VM/SP Release 2 or higher. Its first-year license fee is $5,000.

Autovative Computer Extensions, Suite B, 5120 Belmont Road, Downers Grove, Ill. 60515.

COMPUTRONICS, INC.
Enhancements to AMLC Status

Computronics, Inc. has announced an enhanced version of its AMLC Status software for Prime Computer, Inc. superminicomputer systems.

The enhanced version reportedly features a command that summarizes the current configuration of each Prime asynchronous multiline controller (AMLC) line on the system.

The enhanced software reportedly also includes the capability to display system idle time for any user. The software involves a change to the Prime operating system, Primos. Source code for the change is provided with the order, a vendor spokesman said.

Prices for AMLC Status start at $250, the vendor said.

Computronics, 130 N. Ash, Wood Dale, Ill. 60191.

DATASTREAM COMMUNICATIONS, INC.
Software options

Datastream Communications, Inc. has announced four software options for its 874 Systems Network Architecture (SNA) controller for remote IBM 3270 network operations.

The options, which reportedly widen the scope of 3270 access and user integration, include CRT Attached Printer Support (Caps), which allows a serial printer attached to a CRT or personal computer to access the IBM host computer via a single connection to the Datastream controller.

Another option, the Multiple Session feature, reportedly allows a terminal user to maintain two or more sessions with the host from the same terminal. A graphics option allows selected Ascii-compatible terminals, including Datastream's Display Stations, to perform graphics processing on a host running SAS Institute, Inc.'s SAS/Graph package.

A Keyboard Printer feature allows interactive access to 3270 applications with the application-oriented keyboard printers frequently used in time-sharing or remote locations, according to the vendor.

The options are $100 each per sys-

Continued on page 68

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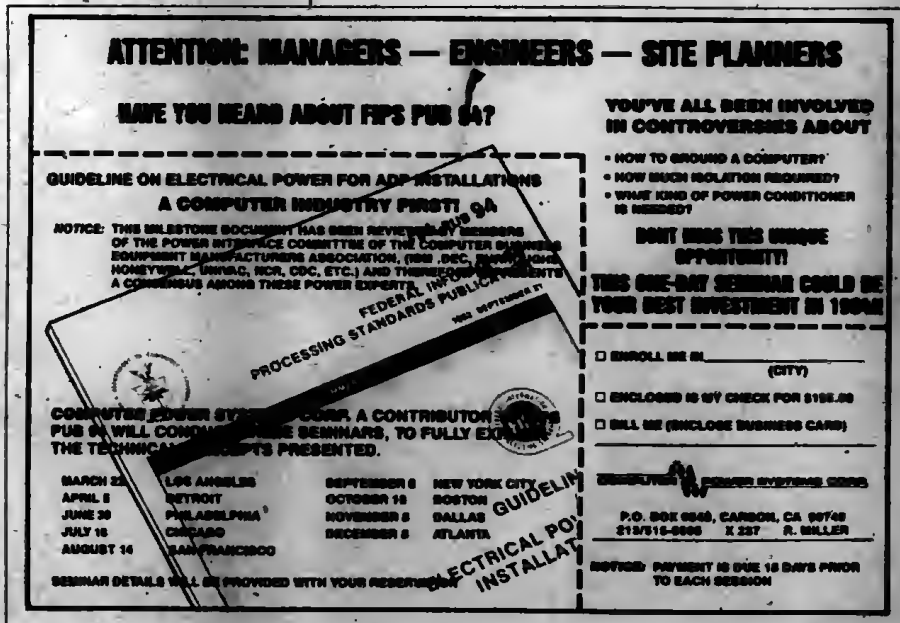
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SOFTWARE & SERVICES

Continued from page 46

tem. System pricing will vary depending on the base system's number of ports and system memory expansion required for multiple sessions and caps, the vendor said.

Datastream Communications, 3590 Mission College Blvd., Santa Clara, Calif. 95050.

PRODUCTIVITY AIDS

ADVANCED TECHNOLOGY INTERNATIONAL, INC.
Super PDL

Advanced Technology International, Inc. has introduced a software design program for use with Digital Equipment Corp. VAX-11 supperminis under the VMS operating system.

Super PDL features a structured design language, design analysis facilities and full documentation capabilities, according to a vendor spokesman. The menu-driven software is said to include a full screen structured editor to create, update and modify module definitions and descriptions and abstract data type definitions.

The software reportedly can be used simultaneously by designers working on discrete parts of the same project. Design analysis is provided by a consistency processor that alerts the user to possible design inconsistencies, the spokesman said.

Super PDL is priced at $15,000.

Advanced Technology International, 350 Fifth Ave., New York, N.Y. 10018.

APPLICATION PACKAGES

SOFT PRO SYSTEMS, INC.
Fixed asset package

Soft Pro Systems, Inc. has announced the fixed asset package for users of Wang Laboratories, Inc.'s VS systems.

The system was designed to allow the Wang VS computer to assist in asset management. It provides for information for asset acquisitions, transfers, retirements and adjustments; protects the annual depreciation expenses for the life of the asset, uses the actual depreciation method or a simulated depreciation method; and produces a summary report showing the current depreciation of all assets before reporting to the Internal Revenue Service. A second report produces a facsimile of the IRS Form 4562 (depreciation and amortization). Several versions of each report may be produced.

The system is priced at $2,000, the vendor said.

Soft Pro Systems, 4121 MacDonald Ave., Richmond, Calif. 94805.

DATAPLOTTING SERVICES, INC.
D-Pict/Meta

Dataplotting Services, Inc. has introduced a utility program called D-Pict/Meta, which is said to aid graphics composition.

The program is said to allow several charts or graphs to be positioned at one time in a display that can be transferred to paper, overhead transparency film or 35mm slides. D-Pict/Meta reportedly allows graphics components to be shifted, scaled, rotated and windowed in any order so that users may experiment with designs.

D-Pict/Meta is available for three groups of computers, all at prices effective April 1. It is available for the Prime Computer, Inc. Model 9950 and Data General Corp. Eclipse MV/10000 at $3,500. It is available for the Digital Equipment Corp. VAX-11/750 and VAX-11/780, Prime Models 450 through 850 and the DG Eclipse MV/8000 at $2,500. It is also available for DEC's VAX-11/725 and VAX-11/730, Prime's Model 2250 and DG's Eclipse MV/4000 for $1,500.

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SOFTWARE & SERVICES

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EXECUTIVE TECHNOLOGY DATA SYSTEMS, INC.
Payroll system

Executive Technology Data Systems, Inc. (ETDS) has announced a payroll system for the IBM System/34 and System/36 that reportedly offers custom-designed checks, multicompany and multistate processing, multiple pay rates per employee and job cost and departmental allocations.

According to the vendor, the system integrates with either the ETDS general ledger system or its accounting system. It can be used for multiple payroll cycles, and payroll reimbursement can be included with the payroll check.

The system runs under IBM's SSP operating system.

The payroll system is priced at $2,900.

ETDS, Suite 108, 28104 Orchard Lake Road, Farmington Hills, Mich. 48018.

STRATUS COMPUTER, INC.
MCBA software

Stratus Computer, Inc. has announced the availability of a set of accounting application packages for its Stratus/32 continuous processing superminicomputer system.

Manufactured by MCBA, Inc., the MCBA accounting package consists of five programs. The central application is general ledger, which can be used in conjunction with the accounts receivable, accounts payable and payroll applications. The package also includes order entry and billing, which interfaces with the accounts receivable application.

A permanent license for each program is priced at $8,000.

Stratus Computer, 17 Strathmore Road, Natick, Mass. 01760.

DATATREND, INC.
Datacalc Version 3

Datatrend, Inc. has announced Datacalc Version 3, an electronic spreadsheet for use with Digital Equipment Corp.'s Datasystems.

Datacalc Version 3's features include columns and rows that can be sorted in ascending or descending order or moved to new locations; an automatic consolidation feature that allows for consolidation of several spreadsheets into one; on-line Help capabilities; and a "find and replace" capability, the vendor said.

New function and display formats include hidden columns, negatives in parentheses and blank on zero. Other new functions include table lookup, weighted average and loan payment calculation.

Datacalc Version 3 is priced at $495 for DEC's RT-11 operating system and $1,795 for the VAX/VMS operating system.

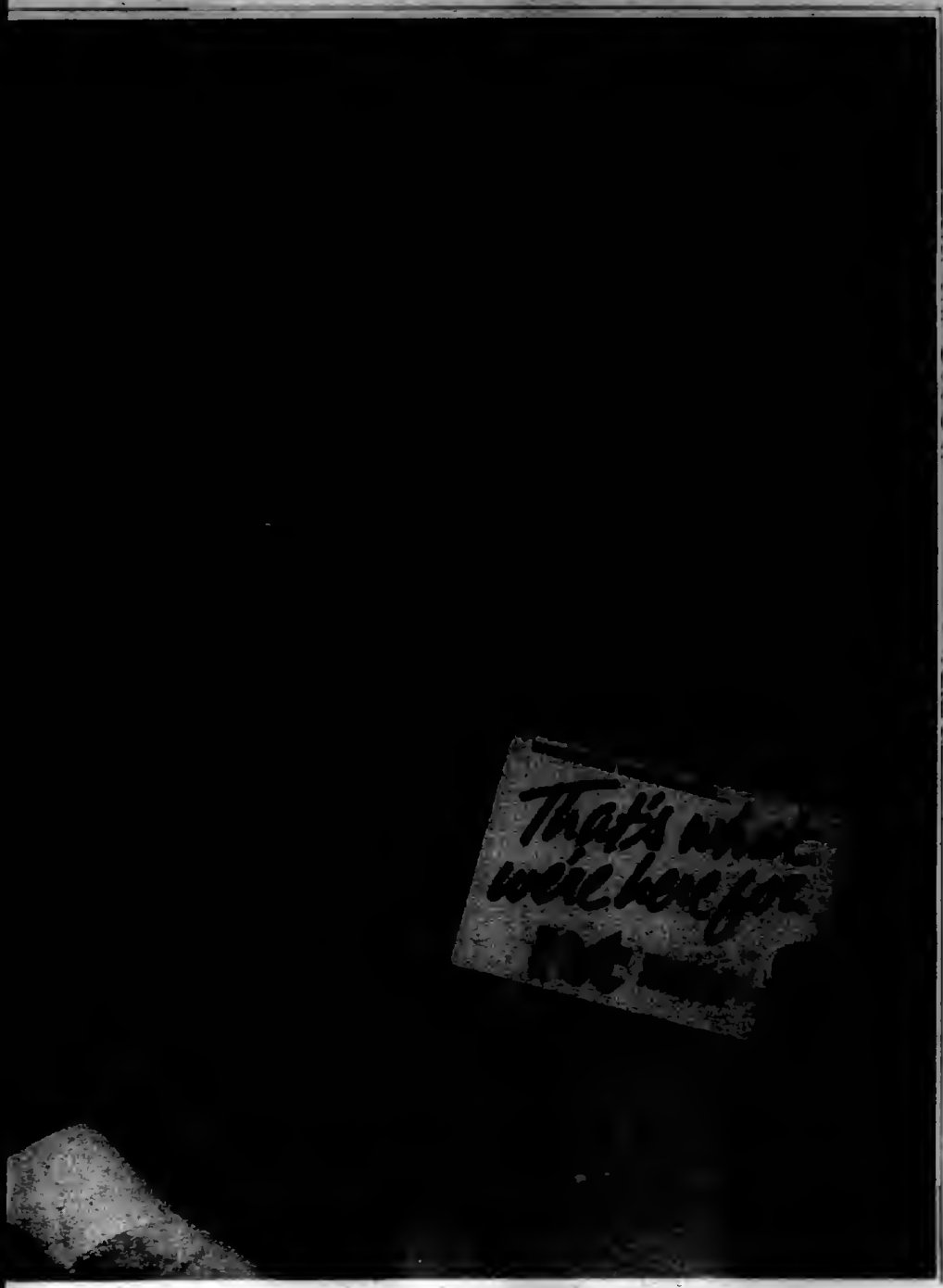
Datatrend, 395 Ironwood Drive, Salt Lake City, Utah 84115.

DIGITAL EQUIPMENT CORP.
Advanced Legal Software

Digital Equipment Corp. has announced that a law practice management application package is now available for its Decmate II business computer.

Advanced Legal Software is said to enable lawyers to perform time and billing, trust accounting, financial reporting and calendar and docket control. The package is targeted to offices containing up to 20 staff attorneys, a vendor spokesman said.

Continued on page 51



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SOFTWARE & SERVICES

Decision support offered based on SAS software

FIRST USER

HOLLYWOOD BEACH, Fla. — Four decision support products based on SAS Institute, Inc.'s SAS software were unveiled by Info Tech at the recent SAS Users Group International Conference.

Among the four is DS/QL, a query and retrieval language similar to IBM's SQL that is said to combine SQL-like relational features with SAS manipulation capabilities. Features of the nonprocedural language, Info Tech said, include English-like queries using SELECT ... FROM ... WHERE expressions; retrieval of data using both the SQL and SAS languages; unlimited nesting of queries; improved data access; display statements; and compatibility with Info Tech's Decision Support/Data Base Facility (DS/DB) SAS data base enhancement, also announced last week.

Any combination of SAS steps and procedures may be used with any combination of DS/QL queries and display statements, according to an Info Tech spokesman. The product costs $4,500 for a first-year license, with an annual renewal fee of $900.

Manipulating big data bases

According to Info Tech, DS/DB is appropriate for manipulating multiriciation data bases that are too large for SAS to handle. DS/DB provides direct-access facilities for SAS data sets and, when compared with similar SAS facilities, reduces disk I/Os and CPU time required to retrieve observations on large-scale SAS data sets, the spokesman claimed.

The product's SAS Data Set Cluster is a collection of three SAS data sets that define the target data set and the key variables used to subset the data. The Proc DB Build statement is an SAS procedure to create data set clusters. The Proc DB Search is an SAS procedure to select observations from an SAS data set cluster using random-access techniques and query optimization.

DS/DB is priced at $6,000 for the first year, with an annual renewal fee of $1,200.

The third product announced last week, DS/GEN, is a set of interactive system definition, generation and evolution tools for the development, installation and maintenance of decision support applications.

DS/GEN can be used to define data bases using a data dictionary; create an interface for the data collection phase; organize information from the data dictionary to create data bases; create design and analysis documentation; load, update and maintain the decision support system (DSS) data base; and prototype with automatic restructuring of the DSS data base during migration or enhancement. It costs $7,500 for the first year, $1,500 for an annual renewal.

The final product, Decision Support Dialog Manager (DS/DM), is a menu-driven system that allows a nontechnical user to perform functions of data management and analysis and system management using full screen IBM Interactive System Productivity Facility panels. The user does not have to learn operating system or terminal commands, IBM JCL or SAS programs, the spokesman claimed.

The product is available for $9,500 for the first year and $1,800 for each subsequent year. Package prices are also available for combinations of the products from Info Tech, which can be reached through P.O. Box 14545, Gainesville, Fla. 32604.

SAS/OR from page 39

group of R&D scientists in Ciba-Geigy's agricultural products division. Each user will be prompted by the system to build a data base of estimated completion times and cost variables for different parts of a project.

The program will rely upon statistical capabilities within SAS to relate the elements of the data base and come up with an orderly flow of events through the life cycle. In order to model a proposed project, the R&D scientist answers a series of screen prompts interactively, filling in about 150 variable components that go into making up that project's life cycle. All screens are being built using SAS' Full Screen Product, Hermes said.

The output will be in the form of a Critical Path Method schedule showing the start and stop dates for the project and the completion times for each component. The planning model will also produce a set of financial figures showing the effect of different cost and pricing variables on project profitability. The financial routines will probably be written in either SAS' new FS Calc spreadsheet product, Execucom, Inc.'s Interactive Financial Planning System or in standard SAS code, Hermes said.

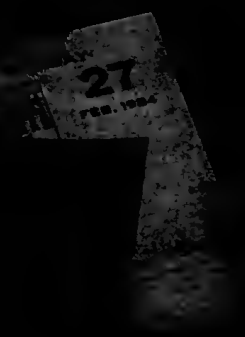
Because the application is on-line, variables can be changed and the model rerun to test the effect of different scenarios, much like a "what-if" financial model.

The application will even run a series of models based upon a set of costing figures chosen at random and clustered around the cost estimates. "The basic question it answers is, 'Is this the best way to spend our money?' " Hermes said. "It tells — before the project starts — if the investment is worth it."

Hermes said she recommended SAS/OR for the project largely because of its compatibility with the entire SAS line. In addition, the product is "very easy to use," she said. "I wrote a basic [Critical Path Method] routine in about two hours.

"Every new SAS product follows the old rules," Hermes noted. "Also, your output is in the form of an SAS data set, which you can then manipulate to your satisfaction. In most cases, the user isn't happy with a canned data set."

The product also uses a command structure similar to other SAS products and allows SAS routines to be embedded in SAS/OR code.



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but not surprised. Almost 20
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Magnetics the tape
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SOFTWARE & SERVICES

Continued from page 47

The software, manufactured by Advanced Legal Software, Inc., features password protection, five types of fee categories, multiple billing rates and both monthly and deferred billing arrangements.

The software is available now for $3,195.

DSC, 146 Main St., Maynard, Mass. 01754.

SPSS, INC.; MCMASTER UNIVERSITY

SPSS-X Information Analysis System

SPSS, Inc. and McMaster University of Hamilton, Ontario, have introduced versions of the SPSS-X Information Analysis System software for the Hewlett-Packard Co. HP 9000 microcomputer and the SCSS Conversational System software for the HP 9000 superminicomputer.

SPSS-X contains file handling and reporting facilities and includes more than 40 statistical procedures to organize, summarize and display data, according to a vendor spokeswoman.

SPSS-X on the HP 9000 reportedly accommodates nested or hierarchical files such as those found on the U.S. Bureau of the Census data tapes, enabling users to use census data for applications in marketing research or demographic analysis, the spokeswoman said.

A first-year commercial license for SPSS-X costs $6,000, according to the spokeswoman, with annual renewals available for a price of $4,500.

SCSS, a conversational and interactive version of SPSS-X, is an integrated, stand-alone system for data analysis and information management. It is said to feature a number of statistical capabilities, such as univariate statistics, cross-tabulations, t-tests, scatter plots, correlations and factor analysis.

SCSS for the HP 9000 is priced at $6,000 for a first-year license and $4,000 each year for renewals.

SPSS, 444 N. Michigan Ave., Chicago, Ill. 60611.

TRAINING

ETA INTERNATIONAL

Video education courses

ETA International has announced a video education course covering the joint use of Cullinet Software, Inc.'s IDMS data base management system and IBM's CICS teleprocessing monitor in application programming and execution.

The course is comprised of five video sessions, including video graphics, examples, narrative text and reinforcing exercises. Among the areas covered in the course are the IDMS/CICS problem program environment, terminology, program coding and compilation techniques.

The course costs $3,500.

The vendor also introduced a second video course that addresses the systems design, programming and run-time of applications using Cullinet's Applications Control Facility. The course is priced at $4,000.

ETA International, 7 Wells Ave., Newton, Mass. 02159.

DATA from page 59

related to a marketing data base. It is easy to say that the data modeler should have recognized the relationship and should have designed the relationship into the system from the outset, but not all relationships are cost-effective to maintain.

The modeler may well have recognized the relationship, but the occurrence in which the relationship is used is so obscure that creating and maintaining the relationship is not cost-effective. Therefore, data may well exist in a subject data base that is unable to be applied to other subject data bases.

The final issue of subject data bases is refinement and replacement of data.

Oftentimes, subject data bases are accessed and data stripped off.

The data that is stripped is then analyzed separately, perhaps by reordering or resummarizing.

The result is a refinement of the data that is useful to at least one user.

While this refinement is a worthwhile activity and represents a new and valid view of the data, there are several problems.

Several problems

It is very difficult to make the refinement available to other users. For example, a user extracts data from the mainframe environment into the personal computer environment.

There the extracted data is refined and analyzed and produces meaningful results for the user. The problem is: How does the user make the refined data available to other users?

Replacing it in the subject data base is not an answer in most cases, because the refined data now represents a different view of the data. Creating a new data base is not the answer because the new data base most likely is redundant with the subject data base.

So, there is no easy answer for the issues of refinement and replacement.

Careful implementation

While subject data bases unquestionably are a worthwhile objective in the integration of systems, they must be carefully implemented.

If the result of the modeling effort that produced the subject data bases is not extended into the realm of tangible data bases, then there is no purpose in modeling systems.

The implementation of subject data bases is especially relevant to the on-line and decision support environments.

Centralization of data, implemented improperly, hinders on-line performance and availability.

Centralization of data must be carefully implemented to achieve data consistency, data applicability and data refinement.

Inmon, a director at Coopers & Lybrand in Denver, is a noted author on the subject of data base design and a regular contributor to Software.

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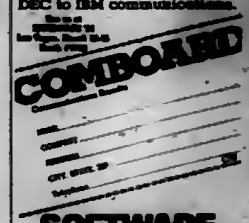

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CORPORATE HEADQUARTERS

#931 1984 Office Automation Conference, L.A. Convention Center, February 20-22 1984

COMMUNICATIONS

DATA STREAM
John Dix
CW Senior Editor

AT&T releases interface option

AT&T Information Systems, Inc. recently proposed a private branch exchange (PBX)/computer interface that is significant in its design similarities with international standards efforts, but that presently lacks the support of other switch manufacturers needed to make it important for here-and-now problems.

Much of that support has already been pledged to the Computer-to-PBX Interface (CPI) developed last year by Northern Telecom, Inc. and Digital Equipment Corp. and proposed as a standard to the Electronic Industry Association.

The two proposals, which are incompatible, specify the type of control signaling and data formats used to connect a PBX to a computer via the domestic telephony standard 1.54M bit/sec trunk interface.

As the first effort to standardize the interface, the Northern Telecom/DEC duo gained a lot of early support, including the endorsement of Rolm Corp., Mitel, Inc. and Intecom, Inc. and commitment from Wang Laboratories, Inc., Data General Corp. and Prime Computer, Inc. Northern Telecom claimed that 50 CPI licenses have been granted so far.

But now that AT&T has released specifications for its Digital Multiplexed Interface (DMI), some computer vendors seem more than willing to hedge all bets by endorsing both proposals, as Wang and DG have done.

See AT&T page 58

Bank contracts Rolm hardware

To replace existing systems in over 700 branches

By John Dix
CW Staff

SANTA CLARA, Calif. — In evidence of the fact that data handling capabilities still play second fiddle to vanilla-voice capabilities for private branch exchanges (PBX), a large bank here said that it has no immediate plans to switch data with the new systems it is installing.

Rolm Corp. announced last week a major contract with Bank of America National Trust and Savings Association to replace existing communications systems in more than 700 branch locations and regional centers in California.

The deal, valued at $15-$19 million, calls for Rolm to install switching equipment — its own PBXs and some key systems procured by Rolm from outside sources — in each of the bank's locations to replace existing Centrex services and a few small Northern Telecom, Inc. switches. So equipped, each location will then be tied into the bank's statewide Electronic Tandem Network.

James J. Sobczak, Bank of America's vice-president of telecommunications services, said that roughly half of the bank locations would install key systems while the other half would be putting in Rolm CBXs, including Rolm's recently introduced CBX-II.

He estimated that, on the average, the key system installations would support up to 20 users, and the CBX-II sites would have 80-100 lines. All told, the entire system will reportedly support 25,000 telephones.

Interestingly, Sobczak said that the bank has no immediate plans to use the PBXs in the new system to switch data, although he doesn't preclude that the need may materialize. Instead, voice management considerations have led to the decision to install the switching hardware.

See PBX page 58

Lemcom device targets small SNA users

Supports remote 3270s without 3705, 3725

PHOENIX — Lemcom Systems, Inc. recently introduced a device that enables smaller users of IBM Systems Network Architecture (SNA) who don't have a 3705 or 3725 communications processor to support remote 3270s.

The Virtual Local Controller (VLC) reportedly supports all features of both dial-in and dedicated Synchronous Data Link Control 3270s by making them appear to a host system as local SNA 3270s.

Teleprocessing software is therefore not required. Remote SNA 3270s are configured as if they were connected to an IBM 3705 with a network control program. Application programs require no modification and run under standard Vtam, the vendor reported.

Line speeds up to 56K bit/sec are supported by the device, which is said to be modular for ease of maintenance. The VLC provides internal diagnostics, an on-line tracing capability and a dial-up connection to a service center permitting remote configuration, system diagnosis and software updating.

Prices start at $15,973 and vary depending upon configuration.

-Lemcom Systems is located at 2104 W. Peoria Ave., Phoenix, Ariz. 85029.

- T-Bar Inc. announces a matrix switch that supports the 256K bit/sec channel speed of IBM's 3725 front-end processor/56
- Local Data, Inc. has unveiled a protocol converter that enables IBM 3178/3278s to emulate RS-232C asynchronous devices/56
- Metapath, Inc. unveils a data switch to interconnect RS-232 devices/56

INSIDE

Voice/Data Communications/56
Protocol Converters/56
Multiplexers/Modems/56
Local-Area Networks/56

Speaker outlines key factors for selecting local-area nets

By Phil Hirsch
CW Washington Bureau

LAS VEGAS — Two key considerations in selecting a local-area network are determining whether the application can tolerate transmission delay and deciding how much and how variable the delay can be.

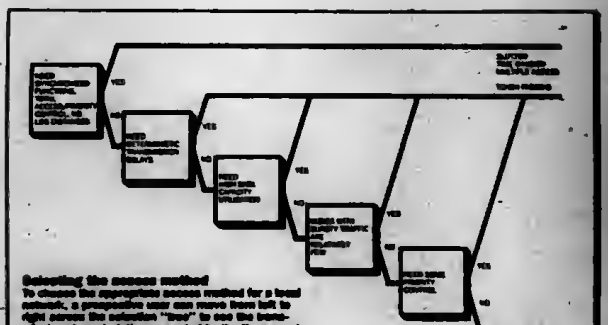
So said Howard Frank, consultant and president of network designer Contel Information Systems, Inc., who spoke at the recent Interface '84 conference here.

Frank explained that if no delay is allowable, a dedicated channel scheme employing frequency, time or space division access is a likely option. If some delay can be accepted, but it cannot vary — often the case in synchronous data transmission — a polled access scheme like token passing would be more suitable. Where delay can be variable, contention-based systems such as carrier-sense multiple access might be employed.

The final choice of access method depends on a number of other considerations, Frank said. For example, dedicated channels are wasteful if the traffic is bursty and the terminal population is large. Polling schemes encourage high throughput by preventing message collisions, but as the number of users grows, the time and expense of managing the access allocation process also grow.

Contention-based systems sidestep this management problem, and schemes for minimizing interference among contending terminals are available. But if the network serves many terminals and contention is frequent, throughput can be reduced drastically, Frank said.

Frank presented a diagram (see figure) showing the main factors to consider in choosing among dedicated, polled and contention-based access schemes. A second diagram (see page 56) showed that the choice of transmission medium — twisted pair, baseband or broadband coaxial cable — depends mainly on distance, the desired bit rate and the amount of voice and video in the traffic mix.



Selecting the access method
To choose the appropriate access method for a local network, a prospective user can move from left to right across the selection "tree" to see the transmission characteristics supported by the three most popular access techniques: divided time division multiple access, token passing, and carrier sense multiple access with collision detection.

One of Frank's major points was that because transmission media, access methods and topologies are well defined, the two biggest problems with local-area networks are internetwork management and managing communications between remote terminals and host-resident communications control or application software.

Because "standards" in this area are proprietary, Frank explained, incompatibility will tend to persist as a problem.

Another complication Frank noted is that the interface connecting a terminal to the local-area network bus, ring or loop may contain all, some or none of the logic needed to implement internetwork and terminal-host protocols. Thus, the user cannot determine just by comparing prices whether a particular interface — usually referred to as a bus interface unit or

See NETWORK page 56

COMMUNICATIONS

VOICE/DATA COMMUNICATIONS

T-BAR, INC.
Wideband VSM

T-Bar, Inc. has announced the Wideband Virtual Switch Matrix (VSM) data communications switch, which supports the 256K-bit data rate line cards of IBM's 3725 front-end processor. The Wideband VSM supports digital data rates up to 300K bit/sec.

The matrix switch allows up to 128 attached terminals or devices to be connected simultaneously to 128 data communications equipment ports in any configuration.

The switch is said to be compatible with CCITT V.35, AT&T's Dataphone Digital Service and X.21 as an option.

The modularity of the switch will reportedly allow switch expansion even when on-line. A typical 32 by 32 switch is priced at $66,000.

T-Bar, 141 Danbury Road, P.O. Box T, Wilton, Conn. 06897.

PROTOCOL CONVERTERS

LOCAL DATA, INC.
Versalynx/3278

Local Data, Inc. has introduced a protocol converter that allows IBM 3178 and 3278 displays to emulate a variety of Ascii terminals.

The Versalynx/3278 provides the synchronous IBM terminals with an interface to RS-232C asynchronous ports in addition to their normal coaxial cable connection to an IBM controller.

IBM display users can switch between the IBM control unit and an external Ascii system, access dial-up computer services using autodial modems and access IBM control units on a dial-up basis using conventional facilities or through a voice/data private branch exchange. The price is $695.

Local Data, 3701 Toledo St., Torrance, Calif. 90503

MULTIPLEXERS/ MODEMS

MICROCOM, INC.
SX/1200

Microcom, Inc. has announced the SX/1200, a 1,200 bit/sec error-correcting modem. The modem reportedly enables communication between dissimilar devices that use the Microcom Networking Protocol.

The modem operates at both 300 and 1,200 bit/sec. Attached devices may operate at user-selectable speeds different from that of the modem. An autodial/autoanswer feature stores up to nine telephone numbers, a company spokesman said.

A stand-alone model is priced at $599.

Microcom, 1400A Providence Highway, Norwood, Ma. 02062.

LOCAL-AREA NETWORKS

METAPATH, INC.
Robin

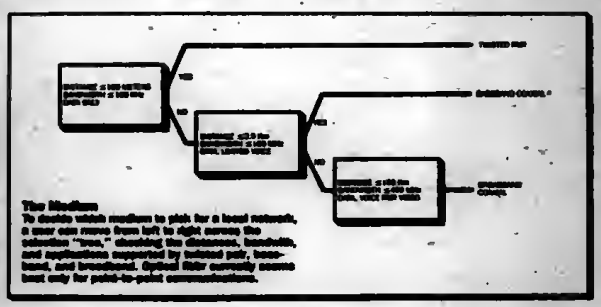
Metapath, Inc. has introduced the Robin, a microprocessor-controlled desktop data switch which it claims permits any RS-232 device to communicate with any other RS-232 device.

The product can reportedly link dissimilar personal and mainframe computers, terminals and peripherals in a local-area network while eliminating centralized controllers, switches and print servers.

Up to 225 switches can be installed on one coaxial cable with 800 serial ports and 225 parallel ports. A bridging feature allows multiple Robin networks to be connected over any distance.

The signaling rate is 2M bit/sec with a maximum aggregate user data rate of 1.8M bit/sec. Single quantity price is $1,950, according to a spokesman for the vendor.

Metapath, 73 Lincoln Centre Drive, Foster City, Calif. 94404.



The Medium
To decide which medium to pick for a local network, a user can move from left to right across the selection "tree," checking the distances, bandwidth, and applications supported by twisted pair, baseband, and broadband. Optical fiber currently seems best only for point-to-point communications.

NETWORK from page 55

media access unit — is a good buy, Frank said.

To avoid the pitfalls, he advised users to define their requirements before choosing their local-area network. He also said the user should assume that whichever local-area network he acquires will have to be modified, both initially and over time.

The technical capability of the supplier is, therefore, important, particularly where adequate in-house support is not available.

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PBX from page 55

Rolm reports that the configuration will be optimized to take advantage of least-cost routing, the process by which the switch selects the least costly manner of switching each call, for example via a Wats or private line.

Additionally, a charge-back system will be implemented whereby "call-costing data will be used to allocate expenses to cost centers," Rolm reported.

The company also said that it has "committed to establish a data base solely for Bank of America that will be used by both Rolm and the bank for ongoing system service and project management."

A centralized "trouble-shooting" center will be formed to receive and process self-diagnostic data from each bank, Rolm said.

AT&T from page 55

It remains to be seen if the PBX manufacturers that have pledged support to CPI will follow suit, and only time will tell which camp the rest of the industry will fall in behind.

If AT&T Information Systems is not able to sway the support of other important PBX manufacturers or at least entreat them to support both interfaces, its efforts will be crimped. This is because AT&T Information Systems' interface only works with the company's digital PBX, the Dimension System 85, of which only a few hundred have been installed.

On the other hand, Henry Theloosen, Northern Telecom's director of product line management, estimated that the universe for the CPI interface — which includes the installed base of switches from Northern Telecom, Rolm, Mitel and Intecom — is 20,000 sites.

But industry support seems to be CPI's single strongest suit, and the industry is just beginning to study the new AT&T Information Systems interface. Dick Moley, Rolm vice-president of marketing, reported that Rolm is now evaluating DMI and said that when the decision to support CPI was made, it was the only game in town.

If, upon study, Rolm and the other PBX manufacturers find appealing in DMI what Hewlett-Packard Co. did, those pledged to CPI might start singing a different tune.

HP, once a CPI supporter, has changed its allegiance to AT&T Information Systems because of design similarities between DMI and international standards efforts. Bob Coackley, section manager for telenetworks at HP, said that CPI was previously supported because it was the only thing going at the time.

As outlined by Coackley and others, Northern Telecom/DEC's CPI proposal subdivides a 1.54M bit/sec channel into 24 56K bit/sec channels. Each of these channels has in-band signaling, which is achieved by using the least important bit in every byte to carry for signal information. This reduces the usable byte size to seven bits and limits channel speeds to 56K bit/sec.

Common channel

AT&T Information Systems' DMI, on the other hand, uses a common channel signaling technique, whereby signal information from each of 23 individual channels is multiplexed into a single 24th channel.

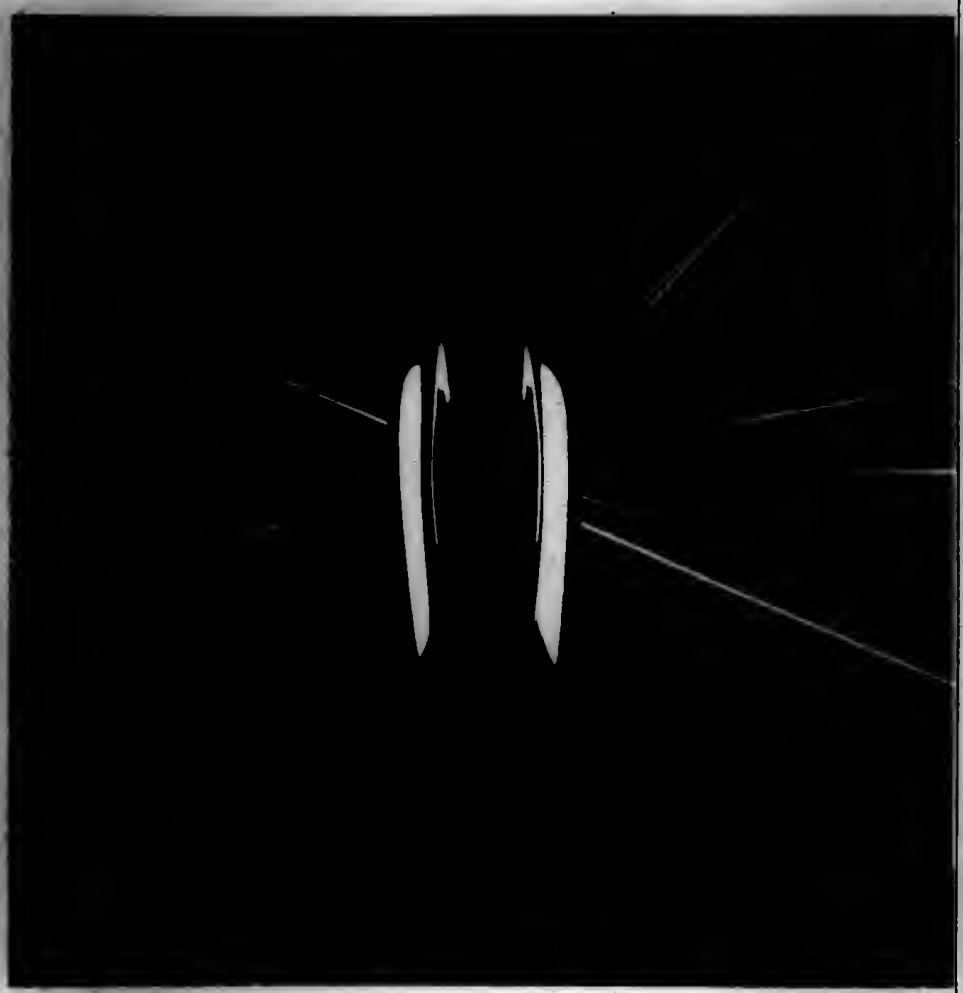
This is important for two reasons: It enables the use of eight-bit bytes and channel speeds of 64K bit/sec; and, according to Jim Day, director of systems engineering at AT&T Information Systems laboratories, it makes the interface look "virtually the same as a [PBX DS1] trunk interface."

Common channel signaling is probably most important because it is the approach being studied by the ITT Consultant Committee for use as an interface standard in the Integrated Services Digital Networks (ISDN) effort.

That part of ISDN that specifies a PBX/computer interface standard is expected by most to be established within two years.

"CPI does not give us a logical stepping stone to ISDN," Coackley said. "DMI does."

This makes HP's interface design efforts somewhat "future-proof," he continued. "We won't have to discard interfaces as we move to ISDN."



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SYSTEMS & PERIPHERALS

IBM unveils CRT versions

RYE BROOK, N.Y. — IBM has announced two prepackaged versions of its 3279 color and 3290 monochrome CRT terminals, which are said to offer users the ability to adapt the units to various keyboard configurations.

Called the 3179 and 3180, the units are said to occupy 30% less space, are 35% lighter and use 20% to 50% less power than earlier 3270 series terminals. In addition, the units come with what IBM said are the most frequently ordered options on 3278 and 3279 terminals.

Among these is a modifiable keyboard with layouts that can be defined by the user. This, IBM said, can be useful for users in organizations that have varied keyboard requirements, such as airline scheduling or inventory control applications. The feature allows users to customize one basic unit instead of placing orders for special keyboard arrangements.

A spokesman said the 3179 and 3180 can be used in place of most of the 3270 line. The 3270 series terminals will still be offered, however.

Using a 3274 or 3276 control unit, the 3179 color monitor can be used with the 8100 distributed processing system. It can also be attached to any IBM mainframe designed to operate under 370-era systems software. Examples of such systems include the 4300 line and the 3080 series of processors, IBM said.

The 3180 uses a 15-in. screen and comes in two models. The Model 1 can be used in the same environment as the 3179. The Model 2 can be attached directly or through a 5294 remote-control unit to IBM's smaller System/38 and System/36 processors, the firm said.

The 3179, which uses a 14-in. screen, and the 3180 Model 1 cost $2,295. The 3180 Model 2 costs $2,195. Shipments of the 3179 began this month. Deliveries of the 3180 Model 1 will begin in May, and the 3180 Model 2 will be available in June.

IBM announced the terminals through its Information Systems Group, located at 900 King St., Rye Brook, N.Y. 10573.

HP plotter touts automatic paper feed

PALO ALTO, Calif. — Hewlett-Packard Co. has announced what it reports is the first graphics plotter with automatic cut-sheet paper feed and a measurement-plotting instrument for laboratory graphics.

Designed to allow business, engineering, science and manufacturing users to produce up to 99 copies of multicolor charts, the HP 7550A is an 11- by 17-in. plotter featuring 31½ in./sec plot speed and 6g acceleration.

According to the company, the plotter includes a replot feature that draws up to 99 copies of an original graph without rerunning the program.

It can reportedly be used as a source of hard-copy graphics in the computer room, for viewing sections of larger plots in computer-aided design and manufacturing, in engineering and science laboratories, as a peripheral in business applications and in production for generating unattended plots for automatic test systems and for process control.

The 6g acceleration reportedly can cut plotting time in half, compared with the standard 2g rate. The plotter features an LCD and front-panel function keys that replace the hard-switch settings used on other plotters.

It allows use of fiber-tip, roller-ball and liquid-ink pens in eight-pen carousels and use of 20 international character sets in two fonts.

The unit features an addressable resolution of .025mm and a mechanical resolution of .006mm and uses a single serial

See PLOTTER page 64

Burroughs airs configurations for its B1900

DETROIT — Burroughs Corp. has introduced two packaged models of its B1900 series of small business systems, called the B1990 Business Partner (B1900-BP) and the B1900 CMS.

The B1990-BP is a single-processor configuration that includes the necessary hardware and systems software to form an applications development system. Included in the package is Burroughs' logic and information network compiler. The packaged system, including a B1965 CPU, 1M byte of main memory, a microprocessor-controlled I/O subsystem, a Burroughs ET100 terminal, a 650 line/min printer and a 130M-byte disk drive, costs $122,000, Burroughs said.

The B1990 CMS configuration features object code compatibility with applications developed on other Burroughs systems using the firm's CMS operating system, including the B80, B90, B800 and B1900.

The basic configuration of the B1990 CMS includes a 6-MHz central processor with 8K bytes of cache memory. A minimum main memory configuration of 512K bytes, which is expandable to 2M bytes, is offered.

Also included is a 130M-byte, removable-pack disk drive, an I/O subsystem controller, a communications processor, dual-line adapter, terminal and line printer. The base configuration costs $70,000, the vendor said.

The latest two models are also said to incorporate features not available on the original B1900, announced last October. Among these are an integrated diagnostic subsystem called Burroughs On-Line Test and a remote-access capability.

Burroughs made the announcement at its corporate headquarters, which is located in Burroughs Place, Detroit, Mich. 48232.

INSIDE

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Japanese sparking supercomputer competition with U.S.

By James Connolly
CW Staff

Much has been said about the government-sponsored efforts by the Japanese to develop a new generation of computer systems set to equal or surpass the capabilities of those offered by U.S. manufacturers. Most of the Japanese development efforts have been centered on two general fronts: supercomputers and artificial intelligence processing systems.

Now in the third year of a 10-year development project, the Japanese have been able to show concrete results to their research. Three of the leading Japanese computer makers have announced supercomputers which appear to compete with Cray Research, Inc., Control Data Corp.'s spin-off ETA Systems, Inc. and Denelcor, Inc. — all leading U.S. manufacturers.

Details of the Japanese supercomputers are still fuzzy. But industry watchers report that in recent months, the first supercomputers produced by Hitachi Ltd. and Fujitsu Ltd. have been installed at test sites. A third Japanese manufacturer, Nippon Electric Corp. (NEC), expects to deliver its first supercomputer in early 1985.

The Japanese companies have promoted their high-end machines as providing optimum performance levels ranging from 500M floating-point operations per second (Flops) to 1.3G Flops, significantly faster than the 100M- to 800M-Flops performance range claimed by the U.S. manufacturers. While the U.S. supercomputer makers have vowed to develop a 1G-Flops processor by 1987, some researchers are skeptical that the Japanese processors can achieve their performance claims. And few researchers have had the opportunity to run benchmarks on the Japanese systems.

One of the big differences between the Japanese supercomputer vendors and the U.S. manufacturers is that the three Japanese firms are offering machines which are still basically experimental. The three major U.S. manufacturers all have installed systems. Long-time supercomputer maker Cray Research has installed nearly 70 processors since 1976. CDC claims it has installed 22 processors, and Denelcor has installed six.

Benchmarks run on the Fujitsu VP-200 and VP-100 and the Hitachi S-810/20 showed the three machines generally exceeding the performance of the fastest American-built machines, the Cray XMP and the CDC Cyber 205, according to consultant Dr. Sydney Fernbach of the San Jose, Calif., area. Fernbach based his opinion on benchmarks recently run by supercomputer experts from the Lawrence Livermore Laboratory in Livermore, Calif., and the U.S. Navy Postgraduate School in Monterey, Calif.

In the Livermore Laboratory benchmark, a Cray XMP single processor performed at 53M Flops, while the VP-100 was rated at 80M Flops and the VP-200 at 131M Flops, Fernbach reported.

In the Navy Postgraduate School's benchmarks, the Fujitsu machines ran "a little faster than the Cray," Fernbach said.

Announced in 1982, the VP-100 has been installed at the University of Nagoya and is being installed at the University of Kyoto. The higher performance VP-200 apparently hasn't been installed outside of Fujitsu facilities, Fernbach observed.

Hitachi's S-810/20 at the University of Tokyo became operational in December, he said.

He added that less is known about the Hitachi machines, other than the fact that the S-810/20 did

See JAPAN page 64

SYSTEMS & PERIPHERALS

TURNKEY SYSTEMS

ELECTRONIC REALTY ASSOCIATES, INC.
ERA Command

Electronic Realty Associates, Inc. (ERA) has announced a professional real estate management computer system that reportedly combines word processing, financial spreadsheet and a real estate brokerage management system with multiuser and remote capabilities.

ERA Command is built around a Control Data Corp. CPU, which features the Intel Corp. 8086 16-bit microprocessor. Standard memory is 512K bytes, expandable to 1M byte. All memory has byte parity error detection, ERA said, and a proprietary memory management system allows separate control of each 4K-byte block of memory.

A variety of peripherals may be used with the system, including double-density, 5¼-in. floppy disk drives, hard disk drives and magnetic tape. The operating system is Microsoft, Inc.'s Xenix.

Software provided in the basic ERA Command system includes Microsoft's Multiplan financial spreadsheet, which provides financial management, a 63-col., 255-row accounting system and some forecasting capabilities; the Altos Computer Systems, Inc. Horizon word processing system, which includes a 40,000-word spelling checker and mail/merge capabilities; and the ERA Real Estate Blueprint for Success real estate management program.

Blueprint tracks listings and runs mortgage qualifying data for prospects, calculates individual and average days on market, analyzes salability of individual and overall listings, tracks individual and overall agent performance, handles office projections and analyses short- and long-term trends.

Basic ERA Command hardware includes CDC's CPU, terminal and keyboard, 727-40 daisywheel printer, cables and starter kit. Optional equipment includes a tractor feed for printers, additional terminals, printers, tape drive and modems.

The cost of the basic ERA Command system is $10,500; lease arrangements are also available.

Electronic Realty Associates, 4900 College Blvd., P.O. Box 2974, Shawnee Mission, Kan. 66201.

SUMMAGRAPHICS CORP.
Enhancements to Icon

Summagraphics Corp. has announced it has enhanced its Icon Series computer-aided design (CAD) system to incorporate the use of color-raster graphics. The Icon Series reportedly is for use in printed-circuit board, architectural, engineering and construction design.

Icon Series software is said to permit users to preview, create, edit, store and recall graphics at a workstation. The Icon Series workstations are said to be self-contained and to incorporate an integral digitizer with menus and two tilt-and-swivel monitors.

The Icon Series CAD system is available for the Data General Corp.

Continued on page 62

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SYSTEMS & PERIPHERALS

Continued from page 60

Desktop Generation computers. A four-workstation, black-and-white monitor configuration costs $149,000. A four-workstation color monitor configuration is available for $180,000.

Summagraphics, 777 State St. Extension, P.O. Box 731, Fairfield, Conn. 06430.

DATA STORAGE

COMPUPRO SYSTEMS, INC.
Disk 1A

Compupro Systems, Inc. has introduced a floppy disk controller that utilizes direct memory access (DMA) arbitration to handle any combination of up to four 8-in. or 5¼-in. drives.

Disk 1A is based on a third-generation, large-scale integration floppy disk controller chip and is designed for high-level industrial, commercial and scientific microcomputer systems, the company said.

Disk 1A provides for 24-bit DMA addressing across 64K-byte boundaries, with data transfer throughout to 16M-byte memory. The product supports IBM 3740 single-density formats or System/34 double-density soft-sectored formats. Its price is $695.

Compupro Systems, 3506 Breakwater Court, Hayward, Calif. 94545.

JUPITER SYSTEMS
J18, F84, F474 disk drives

Jupiter Systems has introduced a series of disk drives designed to increase the storage for the J12, the vendor's high-speed graphics workstation.

According to the vendor, the J18, F84 and F474 Winchester drives offer 15M bytes, 67.4M bytes and 352M bytes of formatted capacity, respectively, providing the local mass memory needed for solids modeling and image processing applications. The local memory of the Motorola, Inc. 68000-based Jupiter 12 reportedly can be expanded from 256K bytes to 4M bytes.

Two of the J18 disks can be mounted within the J12 cabinet, while the larger models form a separate module. Prices range from $3,000 to $20,000. The disks are available for immediate delivery.

Jupiter Systems, 2126 Sixth St., Berkeley, Calif. 94710.

TERMINALS

MEAD-HATCHER, INC.
2022LP, 2025LP CRT workstations

Mead-Hatcher, Inc. has announced the addition of two models to its Ergo-mate line of CRT workstations.

The 2022LP accepts keyboards up to 22 in. in width, while the 2025LP accepts (word processing) keyboards up to 25 in. in width. Either can be used with existing furniture or mounted on a custom support stand to provide an ergonomically correct stand-alone workstation, the vendor said.

Both models have CRT platforms 2½-in. high. The price for the 2022LP is $115; the 2025LP is $125.

Mead-Hatcher, 752 Military Road, Buffalo, N.Y. 14216.

TERMINAL DATA CORP.
Videomate VMT-1010

Terminal Data Corp. has announced a high-resolution, raster-scan display module designed as a building block for high-resolution image display terminals.

The Videomate VMT-1010 is said to be a full-page, high-resolution raster scan, 16-in. monitor offering flicker-free images of documents, raster graphics and other high-resolution or high-density raster scanned data.

The single-quantity price is $1,740, while the OEM, 1,000-unit price is $695. It is available now.

Terminal Data, 21221 Oxnard St., Woodland Hills, Calif. 91367.

GRAPHICS SYSTEMS

ADVENT SYSTEMS, INC.
Formula One

Advent Systems, Inc. has introduced a microcomputer-based graphics workstation that allows users to create camera-ready documents using as many as 1,500 different characters and symbols.

Called Formula One, the system features a high-resolution, full-page screen with 65 to 128 line/page and up to 250 char./line, plus a 1-mil (one-thousandth of an inch) precision printer with user-selectable draft, memo, letter or typeset quality printing at speeds ranging from 20 to 390 char./sec.

According to the company, the images on the screen, which may contain combinations of up to 1,500 different characters, scientific symbols or a mix of text and graphics, are duplicated exactly on the printed page.

Both the display and printer can access up to 16 different fonts, each containing 96 characters or symbols.

Formula One can be used with most 16-bit microprocessors operating under either Digital Research, Inc.'s CP/M 86 or Microsoft, Inc.'s MS-DOS. The display/printer station plus the image processing software is priced at $9,995 in single quantities.

Advent Systems, 400 Amherst St., Nashua, N.H. 03063.

BOARD-LEVEL DEVICES

GENERAL ELECTRIC CO.
CCM3 communications module

General Electric Co. has announced the CCM3 communications module for its Series Six line of programmable controllers.

The CCM3 allows interfacing to Fisher Controls' Provox instrumentation systems via Fisher's type DH6005 programmable controller interface unit. Up to eight GE Series Six controllers can be connected to a programmable controller interface unit. A total of 64 registers of data (either analog or discrete values) can be communicated to the Fisher unit from the Series Six controllers, the vendor said.

The Fisher system can also change values in the Series Six controllers. Available in April, the CCM3 is priced at $1,500, according to a company spokesman.

GE, Programmable Control Department, P.O. Box 8106, Charlottesville, Va. 22906.

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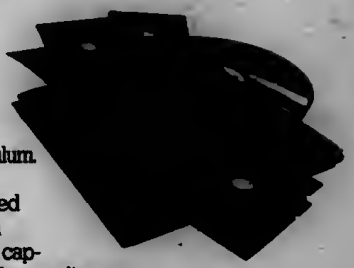

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computer port.

The HP 7550A is priced at $3,900 and can be delivered four to six weeks after receipt of order.

The company's measurement plotting system is the HP 7090A, which is designed to combine the benefits of digital plotters, waveform and X-Y recorders and data acquisition systems into a single laboratory graphics device.

As a low-frequency waveform recorder, the HP 7090A reportedly provides 1K words by 12 bits of buffer memory and a 30K sample/sec analog-to-digital converter on each channel. Sinp response is said to be 3 kHz.

As an analog X-Y recorder, it is said to offer three high-sensitivity, high common-mode rejection rate inputs for X-Y or Y-T recording, 41,000 calibrated sensitivity ranges and zero offsets, 2g constant acceleration and 50 in./sec slewing speed.

According to the company, it also can perform as a plotter when connected to a controller or smart instrument. It includes 42 HP-GL graphics language instructions and draws at 29½ in./sec, the company said.

Output can be plotted on 11- by 17-in. paper and 8½- by 11-in. paper and transparency film. As a component in a data acquisition system, it reportedly can send data to a controller at a streaming rate of up to 250 sample/sec.

Available six weeks after receipt of order, the HP 7090A is priced at $4,400. More information is available from HP, located at 1820 Embarcadero Road, Palo Alto, Calif. 94303.

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perform in the area of 100M Flops, faster than the American machines, but slower than Fujitsu's.

"It's still pretty good performance. I didn't expect Hitachi to be at a lower level than Fujitsu, but it is still premature to say that one machine is superior to the other," Fernbach said.

He also stressed that with software modifications, the Cray XMP was able to reach 100M Flops in a later test.

Peak performances

Still a year away from production, the NEC SX-2 supercomputer is billed as being capable of 1.3G Flops and the NEC SX-1 supercomputer at 570M Flops. Hitachi claims a peak performance of 630M Flops for the S-810/20 and 315M Flops for the S-810/10. Fujitsu claims a peak of 500M Flops for the VP-200 and 250M Flops for the VP-100.

While the Japanese manufacturers are marketing their supercomputers in Japan now, or in the NEC case planning to market them, it may be several years before they are sold in the U.S., reported Dr. John Riganati, chief of computer systems for the National Bureau of Standards.

He noted that each of the three Japanese companies claims to have a one-third share of the Japanese supercomputer market, estimated at 100 potential installations.

Fernbach noted Fujitsu, said to be negotiating with Amdahl Corp. regarding an American supercomputer distribution network, may use that type of agreement to beat Hitachi to the American marketplace.

Riganati said the Japanese products appear to be on schedule and added, "They appear to be producible. They aren't made with the hard, custom wiring that Cray had to go through."

Riganati said, "In general, the machines appear to do considerably better than anything in the American marketplace today. But I would not say the Japanese are ahead. They have built machines, which have to be taken seriously, using state-of-the-art technology."

Advantage in software

Riganati and Fernbach concurred that two of the advantages that the Japanese hold are in the area of software and that the machines are IBM-compatible.

They noted that Cray founder Seymour Cray, who is working on what are expected to be faster successors to the XMP and Cray 1, limited the company's market by relying on customers to develop their own software.

But Cray and ETA Systems, which traditionally has offered more standardized software than Cray, don't offer IBM compatibility. For the Japanese, IBM compatibility means the ability to rely on an IBM mainframe as a front-end machine, using standard IBM software.

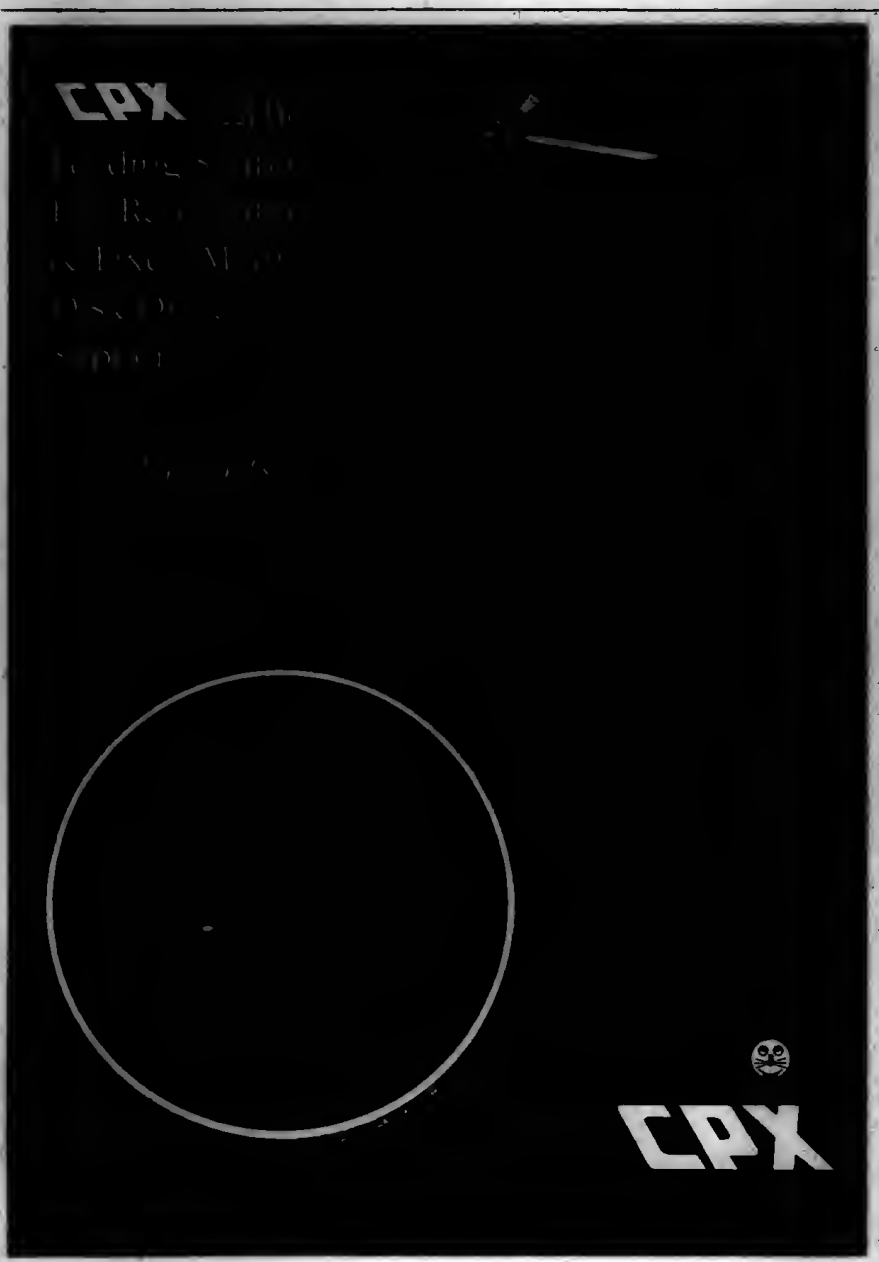
Riganati and Fernbach noted that the compatibility feature may make Japanese supercomputers more attractive to IBM shops such as businesses, rather than just government agencies or researchers. That compatibility may speed IBM's move into the supercomputer market, Riganati said, adding that IBM has a significant 15% to 20% scientific base.

The industry observers also said the Japanese companies, particularly Fujitsu, appear to have made better use of software in the vector portion of the processors.

"They were able to go in and put in better vectorizing routines than we have done," Fernbach said, noting that some of the Fujitsu edge came from its researchers' work at the University of Illinois, work that he said American companies failed to use to full advantage.

What remains unknown, however, is how the Japanese supercomputers will be priced in the U.S.

Riganati and Fernbach said they expected the systems to be "in the ballpark" with their American competitors. That would mean prices in the range of $15 million to $20 million, depending upon the configuration, according to Fernbach.



IN DEPTH

ILLUSTRATION BY RICHARD TOMMEY

Third-party liability insurance: protection in case of computer error

By Paul Cottrell and Barry D. Weiss

All computer-age businesses can apply a three-step management program to insure properly the risks they face. Such a program will often include consultation with computer-knowledgeable legal counsel, risk management consultants and underwriters.

Step 1 is to define the risks. For example, programmers, systems analysts and other design-oriented professionals may face negligence or malpractice claims if a program malfunction causes injury to either their clients or third parties. The case law in this area is still extremely unsettled, but even unfounded claims can require substantial defense costs.

As the standards of professional practice for these computer specialists become better defined, injured parties will try to hold these specialists to a higher "professional" standard of care — much like doctors, accountants, architects and lawyers. Hardware and software manufacturers face possible product liability claims as well as contract-based claims from dissatisfied or injured users or third parties. Again, much of the case law in this area is unsettled, but the incidence of user suits is well documented. NCR Corp., for example, was found liable in a number of multimillion-dollar user suits.

Few insurance brokers appreciate the new and unusual risks accompanying computer use. Nevertheless, armed with a rudimentary understanding of policies available as well as the risks to cover, the DP manager or vendor can now find adequate coverage to ensure financial survival.

Step 2 in risk reduction. Risk reduction is the attempt to minimize the risk that your enterprise will bear should a loss occur. It has two parts. First, wherever possible, allocate the foreseeable risks through contractual risk-shifting devices. In the vendor-user area, the now common disclaimers of warranty may effectively place certain risks entirely on the user.

Vendors should beware, however, that courts have been extremely sympathetic to the claims of unsophisticated purchasers who sue a vendor whom they allegedly relied upon for expertise. Again, NCR has been held liable in many instances even though it sold equipment under contracts with express disclaimers of warranty.

If a court feels that a disclaimer was not truly part of the bargain, it may not enforce it. Likewise, indemnity or "hold-harmless" clauses can be used. However, as with disclaimers, caution is advised because many courts will not enforce broad indemnity clauses. Users must also be aware of the many risks they face when contracting for a system purchase. For example, sophisticated purchasers of software will insist on a source code escrow deposit to cover the risk that the vendor will not be able to honor its maintenance or updating agreements.

The second part of the risk reduction process is to minimize the damage potential of risks that cannot be allocated to others. For example, duplication of important data media and off-site storage of the duplicates will greatly minimize the damage potential of injury to the on-site media.

Minimize damage potential

The second part of the risk reduction process is to minimize the damage potential of risks that cannot be allocated to others. For example, duplication of important data media and off-site storage of the duplicates will greatly minimize the damage potential of injury to the on-site media.

Step 3 in the risk management program is to make contingency plans for those risks that cannot be shifted to others or completely eliminated through risk reduction planning. These contingency plans must provide for the financial stability of the enterprise in the event of loss. Such planning will almost always include some forms of insurance. The planning may also provide that those to whom you have contractually shifted certain risks will, in turn, provide adequate insurance for the contractual liability that they have assumed.

This is a very conservative approach, but it does give greater assurance that injured third parties will have an insurance fund from which to satisfy potential claims. If they do not, and the primary third-party defendant has insufficient resources, the risk shifting entity may be the only "deep pocket" to which a claimant can look. For example, the fact that a programmer agrees to indemnify a software house against any claims for negligence brought by third-party purchasers will be of little value when the programmer goes bankrupt. But if the programmer has insurance to cover the risks for which he agreed to indemnify, then the software house is assured of adequate financial protection.

As to your own financial planning, larger entities may prefer to set up in-house self-insurance plans. However, such planning requires a high degree of sophistication, resources and, usually, outside risk consultants. Most enterprises will seek various forms of insurance to protect the company's assets.

There are several different forms of insurance on the market today. Some companies offer comprehensive data processing insurance; others offer "errors and omissions" or computer "malpractice" policies. They are being issued by firms such as Shand, Morahan & Co. of Evanston, Ill., St. Paul Fire & Marine Insurance Co., The National Union Fire Insurance Co. of Pittsburgh (a subsidiary of American International Group) and The Chubb Corp. In each instance, these policies are similar in that they define the risk insured so as to provide coverage where traditional policies would not.

To date, there does not appear to be any published court opinion construing the coverage language of this new generation of policies. Nonetheless, there is a fast-growing market.

Common coverage problems

Even as the insurance market begins to recognize and to respond to the peculiar needs of the computer industry, there are still many specialized perils where it is difficult to acquire coverage. And even where coverage is available, there is little uniformity in language among the various policies on the market. Moreover, few brokers appreciate the new and unusual risks accompanying computer use. Nevertheless, armed with a rudimentary understanding of the insurance policies available, as well as the risks he needs to cover, the contemporary DP manager, vendor or professional can now find adequate coverage to insure his financial survival.

The current market for computer insurance (often referred to as

"electronic data processing insurance") includes several different kinds of coverage. Property insurance (often called first-party insurance) covers the direct physical losses resulting from fire, flood or other physical peril. Most home owners policies, for example, will cover a home computer if it is not used primarily for business purposes. If it is, you must look to the specialized market for computers where companies such as Chubb, St. Paul Fire and Marine and Central offer coverage. However, a home owners' policy will not cover loss due to power surges.

Finally, another specialized insurance market is now developing: coverage for unauthorized computer access. This area is being spearheaded by Shand, Morahan & Co. Here, the traditional coverage labels begin to break down since the unauthorized access policy offered by Shand includes both property coverage and liability coverage.

Liability insurance (also called third-party insurance) covers claims brought against the insured by third parties. Liability insurance traditionally breaks down into two subgroups — comprehensive general liability (CGL) coverage and professional liability coverage (the latter often referred to as "errors and omissions," or E&O, insurance).

History and structure

The reasons for this breakdown have to do with the history and structure of the insurance industry and the actuarial differences between the various risks covered. CGL policies are typically written for businesses to provide coverage for ordinary lawsuits (for example, someone slips and falls on the premises), and specific peril insurance can be added on where needed (for example, a manufacturer will add products liability coverage). Broadly speaking, E&O coverage arose to protect professional service concerns such as architects, accountants and lawyers.

Obviously, only certain businesses need certain coverages. An auto repair shop, for example, doesn't need E&O coverage. But there are questions peculiar to the computer industry that have not been clearly resolved, and there is confusion in the insurance market where some of the same risks are addressed both by policies labeled as CGL as well as some labeled E&O. The problem emphasizes the need for DP managers to review carefully the actual insurance language rather than rely on more labels. The DP manager should be aware of these potential problem areas when reviewing individual policies in any of these categories.

Finally, the coverage question is made more complicated by the attempts of some companies to blend or integrate separate coverages into a comprehensive insurance package. For example, St. Paul is offering an "integrated" policy package that includes property, CGL and E&O coverage.

Property coverage

Property or first-party coverage is the traditional insurance that any individual or firm might purchase to provide financial reimbursement for property loss. DP risk managers must consider property coverage for computer hardware, peripherals, software programs, data and storage media. Most traditional property policies do not cover "intangibles" such as software and data. Specialized DP property policies do cover these items. Companies writing in this area include St. Paul, Chubb, Central and Aetna Life and Casualty Co.

While this new generation of policies has been specially written for computers, a careful review of policy definitions is still recommended for any given DP facility because the perils that are insured and the exclusions will vary. For example, time-sharing and service bureau DP facilities that process data for others may need property coverage not only for loss to their own data but also for their client's data. This risk, of course, is a liability risk that may also be covered by CGL or E&O. But traditional CGL policies exclude "contractual liability" coverage.

Again, a careful review of coverage language with your broker is essential.

Once definitional coverage issues are resolved, users must cope with valuation problems. It is difficult (and sometimes impossible) to determine the "value" of certain electronic data. For example, what is the value of time records in the computerized billing system of an accounting firm whose revenues are based on an hourly fee basis? Is it the cost of reproducing those records or the dollar value of the billings lost?

Most DP policies will only cover reproduction costs unless you "value" your data in your policy and obtain specific dollar coverage. A special endorsement to the policy for "valuable papers" may be needed. DP property policies also make available such traditional coverages as accounts receivable endorsements, business interruption insurance and additional (or extra) expense coverage (the additional expense being the cost of recreating the records).

One final word about coverage issues: Careful review of what risks are covered under a property policy is crucial. Insurers generally offer two basic modes of property risk protection packages: first, "defined risk" policies, which only cover the specific risks mentioned; and second, "all-risk" or "blanket" protection, which covers any risk except those specifically excluded. Understandably, insurers charge a lower premium for defined risk coverage. However, many DP insureds have learned the hard way that the traditional

(Continued on ID/8)

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Applied Health Care v. Minicomputer

In a recent case dealing with computer risk insurance, Applied Health Care Systems, Inc. brought suit against Minicomputer Technology, Inc. Applied Health sought recovery of $1.5 million in damages stemming from Minicomputer's introduction of a faulty controller into Applied Health's data processing system.

Applied Health was in the business of providing processing services to health care facilities in Chicago. These facilities used Applied Health's system for storing and retrieving patient care and billing records.

Under an oral contract with Applied Health, Minicomputer Technology, a California corporation, had installed four controllers in Applied Health's in-house data processing system in April 1980.

When the system failed and substantial receivables were lost, Applied Health lost many of its customers and was eventually forced to terminate its business operations. Applied Health sued Minicomputer on the grounds that the controllers were defective. Specifically, it was alleged that a wiring connection caused the malfunction leading to random losses of customer billing and patient care information.

Minicomputer manufactured, marketed and sold both hardware and software products. In the suit brought by Applied Health, Minicomputer was subject to a claim based on a hardware component.

CGL policy

When sued, Minicomputer tendered the defense of Applied Health's claim to its insurance carrier, Centennial Insurance Co., under a Comprehensive General Liability (CGL) policy issued by Centennial to Minicomputer. CGL coverage is a standard policy coverage that all business entities secure to protect themselves for the defense and payment of claims by third parties, that is, parties other than the insured and insurance company. These policies were designed to provide coverage for liability exposure arising from personal or bodily injury and tangible property damage.

Centennial declined to accept Minicomputer's tender of defense because, in its opinion, loss of computer data was not an injury to *tangible* property. The CGL policy's definition of property damage was as follows:

- Physical injury to or destruction of tangible property which occurs during the policy period, including the loss of use thereof at any time resulting therefrom, or:
- Loss of use of tangible property which has not been physically injured or destroyed, provided such loss of use is caused by an occurrence during the policy period.

Centennial argued that coverage under its CGL policy did not apply because the allegedly faulty controllers did not cause "property damage" since information stored in a computer data base is not "tangible property."

Centennial also asserted that even if "property damage" had occurred, the loss would not be covered because of its CGL Policy Exclusion *(m)*. That exclusion provided that the insurance coverage would not extend:

- *(m)* to loss of use of tangible property which has not been physically injured or destroyed resulting from:
- A delay in or lack of performance by or on behalf of the named insured of any contract or agreement, or:
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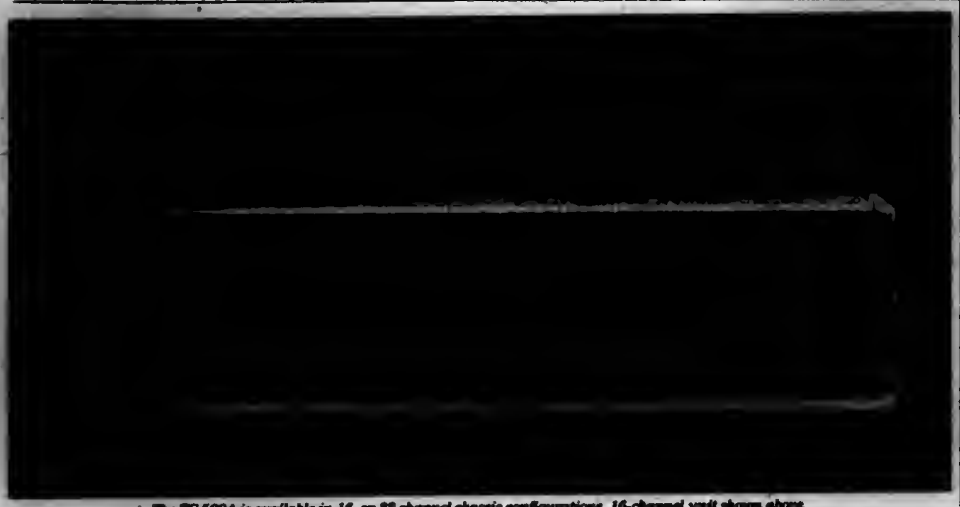

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A case study of liability insurance

work performed by or on behalf of the named insured to meet the level of performance, quality, fitness or durability warranted or represented by the named insured.

Both the exclusion and the CGL policy definition of "property damage" were (and still are) standard clauses in comprehensive general liability policies issued by most major insurance carriers. But, as demonstrated here, this standard language is inadequate for computer-related risks.

Using these two arguments, Centennial informed Minicomputer that it would neither defend Minicomputer against Applied Health's lawsuit nor pay any settlement or judgment should Minicomputer settle or be found liable to Applied Health. Centennial also filed a separate declaratory lawsuit asking a federal court to rule that it had properly denied coverage and that it had no duty to defend or indemnify Minicomputer.

But the federal trial court ruled that Centennial had to defend and indemnify Minicomputer. Centennial appealed this ruling, and while the appellate court held that Centennial did have a duty to defend Minicomputer in the Applied Health litigation, the question as to whether the CGL carrier had a *duty to pay* for any judgment entered could not be decided until trial.

A jury would then determine the nature of the damages and thereby indirectly determine whether the claim was within the coverage perimeter of the CGL policy.

The Centennial case illustrates some of the risks that businesses bear whenever they fail to provide appropriate coverage for data processing liability exposure. For example, the customers of Applied Health ran the risk that their receivables would be destroyed by a faulty computer or program.

Applied Health ran the risk that it would be sued by its customers if it used a defective computer or computer program. And, of course, Minicomputer ran the risk that it would be sued by its customers, and it also ran the risk of incurring legal fees in suing its insurance carrier over the scope of its coverage. Without adequate insurance coverage, these entities have substantial liability exposure. Indeed, Applied Health was allegedly forced out of business.

Liability carriers ordinarily assume two duties. First, the carrier agrees to defend any covered lawsuit filed against the insured. Second, the carrier agrees that if the insured is found liable, the carrier will pay or indemnify the insured for any damage judgment or settlement.

Inadequate insurance coverage exposes businesses to substantial legal defense costs plus uninsured or potentially uninsured contingent liabilities. The carrier's duty to pay, of course, does not become effective until the underlying lawsuit is resolved (a process that may take several years). The carrier's duty to defend protects the insured from the risk of catastrophic legal expense, irrespective of whether the claim is meritorious. The duty to defend and the duty to indemnify or pay are altogether separate obligations.

Returning to our case example, Minicomputer was fortunate that the court held that California law governed the duty-to-defend question. Under California law, the insurer's duty to defend goes beyond the "four corners" of the complaint. A court will also consider any allegations that might have been made under the circumstances.

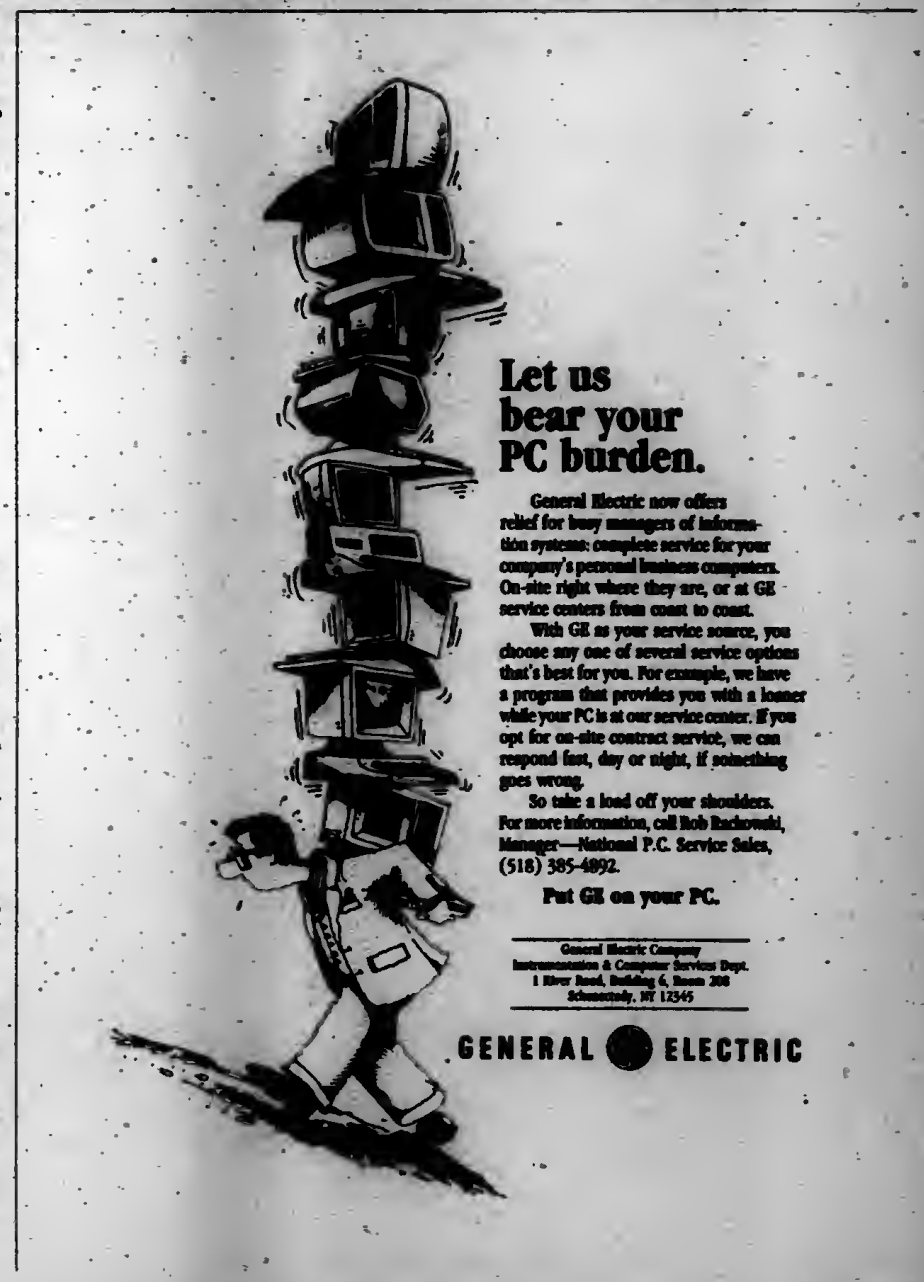
Accordingly, Centennial was obligated to defend Minicomputer against Applied Health even though Applied Health had not actually alleged "tangible property" damage in its complaint, since such a loss might have been alleged given the other material allegations.

Contingent Liability

Even though the court's ruling meant that Minicomputer had coverage for its defense costs, Minicomputer still faced considerable exposure. Since Centennial's duty to indemnify or pay Minicomputer for any judgment in favor of Applied Health could not be resolved until the underlying suit had ended, Minicomputer still carried a potentially uninsured contingent liability. Minicomputer was also stuck paying its own costs litigating the duty-to-defend question against Centennial.

Had California law not applied to the case as that Centennial would not even have a duty to defend, then Minicomputer would have had even greater exposure. Under Illinois law, for example, an insurer's duty to defend is narrower.

Regardless of what state law governed all of Minicomputer's risk could have been eliminated with proper insurance coverage. As it was, Minicomputer's CGL policy language did not clearly cover the risks Minicomputer faced.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(Continued from ID/3)

risks that were "defined" have not anticipated the susceptibility of delicate hardware and software to such risks as power supply malfunctions (such as power surge) and atmospheric or environmental conditions.

Sophisticated DP risk managers can now identify the reasonably foreseeable DP risks and manage such risks through a combination of physical controls — such as surge suppressors and environmental control systems — and defined coverages. Although most of the new-generation computer policies are written on an alleged "all-risk" basis, the exclusions must be examined carefully.

St. Paul, for example, will generally only cover certain mechanical and electrical breakdown risks if you implement proper physical controls. Physical controls ranging from Halon or carbon dioxide discharge systems to complex disaster recovery plans are, at the least, recommended components of a comprehensive risk management plan. These controls will likely decrease the actuarial risk for your facility and thus yield significantly lower premiums to insure your property.

Liability coverage

Liability coverage contains definitional problems similar to those contained in the property line. First, any business entity should have CGL. The question is whether the firm's current CGL coverage is adequate and, if not, whether a different type of policy should be procured.

The traditional coverage provided by the old form CGL policies is inadequate for data processing users because of the problems illustrated in the Centennial Insurance Co. decision (see related story on ID/4). The decision showed that since the traditional CGL coverage language is keyed to "physical injury to or destruction of tangible property," it may not provide coverage for claims arising from loss of data or injuries due to defective software design. Newer policies, such as those issued by St. Paul, Chubb and Shand, address this problem by redefining the coverage.

There are three basic analyses to be reviewed regarding any liability insurance policy. First, how is coverage defined (for example, tangible or intangible, claims-made or occurrence basis). Second, what do the exclusions take away (no coverage for punitive damages or claims based on securities violations). Third, what are the limits of coverage (for example, catastrophic losses may not be insurable, and the insured's risk manager must devise a plan to manage catastrophic losses).

Common coverage questions

Is it a claims-made or occurrence policy? Traditionally, both CGL and E&O policies were written on an "occurrence" basis. This meant that the liability carrier would cover any lawsuit that resulted from an "error" that "occurred" during the policy period (usually one year with the possibility of annual renewals). But as the courts kept expanding the potential liability of manufacturers and others so that they might be held liable today for "errors" committed 20 years ago, the insurance carriers turned more and more to a new type of policy — the "claims-made" policy.

Roughly speaking, this policy only insures you against claims actually made against you during the policy period no matter when the error giving rise to the claim took place. To the carriers, this new claims-made insurance allowed their actuaries to predict their loss potential better. With the long "tail" of exposure inherent with occurrence policies (and the ever-expanding liability imposed by American jurisprudence), the insurance industry simply could not properly plan its own financial risks.

Today, nearly all business computer coverage is written on a claims-made basis. Accordingly, even if your company dissolves or is acquired by others, you may need to provide for insurance coverage some years after if your prior coverage was on a claims-made basis.

Application forms

Another common coverage problem concerns the insurance application. Given the newness of these coverages (and the lack of any substantial loss experience), the carriers are understandably nervous about the risks they are assuming. Indeed, this probably accounts for the fact that there are only a handful of carriers in the market. Accordingly, the applications for these policies are usually lengthy and quite detailed. But it is absolutely essential to give accurate information on these application forms. Any misinformation, even if inadvertent, might be used by the carrier later on to disclaim liability. The law on this issue varies greatly from state to state, so it is wise to review carefully your data input.

The duty to defend and the duty to pay a loss are the two primary duties of a liability carrier under an insurance policy. The duty to defend is uniformly construed to be much broader than the duty to pay. In other words, you may be sued on two counts, but only one count asserts liability of the type insured by your policy.

The carrier will most likely defend the entire lawsuit, but it will do so under a reservation of its right to deny any duty to pay the loss if you are found liable under the count that is not covered. This is a standard practice in the industry; it is perfectly legal and proper so that there is little that you can do about it. You should only be aware of it. In most instances, if there is any merit to the

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claimant's position, the carrier will reach a settlement prior to judgment as to any count, and the reservation issue never becomes a problem.

Many other coverage problems have already been discussed in another context. For example, with property insurance, you want to know what perils are covered: Is power surge loss covered?

Those problems can also arise in terms of liability insurance: Will the liability policy cover claims made against you for loss through power surge of data in your computer, which is vital to a third-party client? If the power surge had nothing to do with any "negligent act, error or omission" on your part (this is the standard E&O coverage language), is it covered?

Uninsurable risks

There are some risks that are simply uninsurable — either by law or because there is no market. Punitive damages, for example, are now held to be uninsurable as a matter of law in many states. Damages in law courts are basically of two types — compensatory and punitive. Compensatory damages are insurable, and these are the damages meant to recompense the claimant for the actual loss he suffered.

On the other hand, punitive damages are meant to punish you, the defendant, for some repugnant intentional act.

The imposition of such damages has nothing to do with compensation to the injured plaintiff. To the plaintiff, it is a windfall. In Illinois, for example, punitive damages are not insurable no matter what the policy language says.

Furthermore, many policies exclude such coverage (for example, Lloyd's, St. Paul's and Shand's unauthorized access policy).

Even though the concept of a deductible is common, make sure you understand whether the deductible applies to defense costs. Some policies have a high deductible. Of course, if you are defending a claim that has little merit, this may not be a problem unless the deductible applies to defense costs. Sometimes this item is buried in a separate and convoluted section defining "claims expenses," in which the deductible clause itself merely gives a seemingly innocuous reference to "claims expenses."

Attorneys' fees today are high. And the fees likely to result from sophisticated litigation over the esoterics of computer programming (particularly where there is little or nothing in the casebooks to help guide the court) may in themselves be a catastrophic loss.

Common exclusions

There are several common exclusions in almost every liability policy. Usually the carrier will not cover liability that you assume by contract (for example, Lloyd's and Shand). This, of course, points to the other side of the coin regarding the first two steps of the risk management plan outlined earlier.

Any good risk management plan must provide for the continuing review of all contracts to make you understand the risks you have assumed by contract. Hold-harmless clauses and indemnity agreements pervade today's business world (in effect, everyone is trying to pass the buck).

Some of these assumptions of risk will be covered by traditional CGL policies (clauses in building lease agreements, for example, are often covered by CGL policies); most others are not. You may need to seek separate contractual liability endorsements for your basic CGL policy or find some other means to plan for the risk of loss you have assumed.

Other common exclusions include patent and copyright infringement (Shand), dishonest or fraudulent acts (St. Paul, Lloyd's) and preparation of tax returns or balance sheets (Lloyd's — of course, this might be covered by an accountant's E&O policy).

The exclusion for fraudulent acts is especially important for systems vendors. Vendors typically disclaim warranties in their standard contracts, but disgruntled users can avoid contractual limitations if they prevail on a fraud theory. Courts in some states, particularly California, have adopted relatively lenient standards for proving fraud in computer contract cases. Insurance cannot help vendors deal with this potential liability.

Typical limits

There are really no "typical limits" in this new field. You must decide what is appropriate. Consultation with experienced brokers or risk management consultants will provide you with a fairly good understanding of the amount of insurance you need.

Obviously, the risk of exposure to costly liability claims is a hazard that all of those in the industry bear — both producers and users. To manage this risk, some planning and allowance for financial coverage must be addressed. For very large companies, self-insurance or risk retention programs may be the answer. However, for the vast bulk of those faced with this exposure, prudent business acumen dictates that insurance coverage be sought.

About the author

Paul Cottrell is an attorney with the law firm of Fohrman Lurie Shier & Simon, Ltd. in Chicago. He concentrates in the areas of litigation, insurance and risk management.

Barry D. Weiss, also an attorney with Fohrman Lurie Shier & Simon, specializes in computer law and litigation.

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COMPUTERWORLD APRIL 2, 1984

A simple measure of software complexity

By Lem O. Ejiogu

Every science must have its own method of investigation built on a sound foundation that is empirical, justifiable and verifiable. Software metrics, too, can benefit from this principle. A complex aggregate of tools, ideas, methodologies, programming languages and varieties of applications go into the development, design, manufacture and maintenance of software. The combinations impose another level of complexity on software.

Despite the amalgam of thoughts and practices, it is possible to select some significant variables to model a measure of software complexity that can be simple, empirical, verifiable and generally applicable.

Scientific investigations traditionally concentrate on critical factors surrounding a phenomenon and build a theory on them. For instance, the tree is used to abstract certain properties of natural relationships, as in genealogy, chain reactions or organizational personnel structures. In software engineering, the tree models data structures and control structures. In a sense, it empirically describes the thing we do.

This time-honored mathematical tradition of modeling with a tree will be extended here first to reveal some attributes of software structure and then to derive a simple model for measuring software complexity. Unlike its counterparts, this model will be applicable to every piece of

What software engineering needs is a metric that can appeal to all software practitioners, irrespective of programming environment or educational background.

software, new or existing. In a nutshell, we have a tool to measure the complexity of every piece of code, large or small.

Software complexity is the first consideration in measuring programmer productivity. Beyond it come other software measures such as structuredness, correctness and reliability.

Conventional measures of software complexity have so far proved unsatisfactory, and many have unsound logical foundations. One of them, lines of code (LOC), is generally discredited. It is biased in favor of programmers who do not optimize their codes. The other, Halstead's Software Science (actually a variation of LOC), does not give the practitioner any intuitive notion of complexity, structuredness, correctness or reliability; nor of whether software is structured or not. In addition, many of its formulas are founded on unproved assumptions.

The Cyclomatic Complexity Measure relies on graphs of software modules. The graphs, also devoid of structured foundations, can become cumbersome for large systems. This measure, too, has received a very limited application.

Empirical studies in the natural sciences have demonstrated that a proper and rational description of a phenomenon can be best approached through abstracting its natural properties or behaviors rather than imposing artificial attributes that might be the product of incomplete human observations. The model advocated here will, unlike its counterparts, be above bias. It is indeed universal, because not only does it apply to every piece of software, it can be used anywhere by anyone who works in software development.

In addition, the model is very easy to compute and may even be automated. Only three variables drawn from the attributes of the tree need be multiplied and the inverse/reciprocal taken. The reason for this reciprocal again follows from the natural property of the phenomenon called complexity. As the size of a system grows, our ability to comprehend its parts diminishes greatly; this growth and its impact on us are inverses to each other. We interpret this experience as the degree of complexity that the system imposes on us.

In the familiar mathematical language of limits, we say that our measure tends to zero as the size gets very large (or tends to infinity). Therefore, this reciprocal expresses our experience naturally and realistically.

But first, in order to avoid any ambiguity or confusion, we remind the reader that there are at least five categories of software complexity:

1. Structural complexity has to do with the natural expression of the topological relationships of a system's components. This theme will be explored here. Structural complexity is more than just the effects of control paths; it is the global attribute of every software module.

2. Computational complexity concerns the relative difficulty of accomplishing arithmetic/logical computations of algorithms on data. This complexity is not an immediate attribute of software, but of algorithms.

3. Logical complexity has to do with the relative difficulty of logical decisions or flows and branches within a system. This is a diminutive or localized structural complexity.

4. Conceptual complexity has to do with the psychological perception or the relative difficulty of undertaking or completing a system; one may also include diversity of human and material resources.

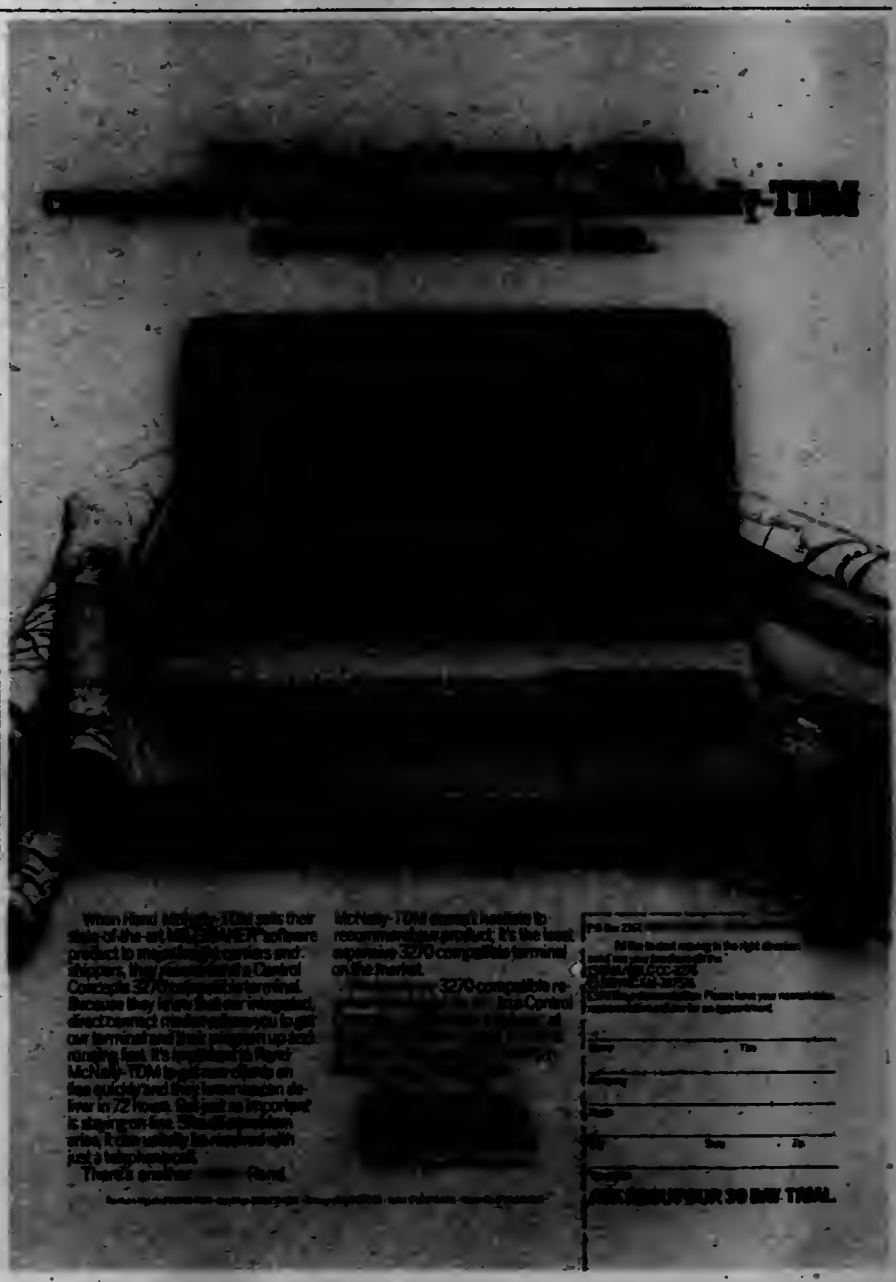
5. Textual complexity has to do with the static analysis of (program) source texts; this condition influences readability. The number N of potential programmer's errors varies as the number W of mental discriminations. Halstead used this psychological assumption to establish the relation $N = k W^{4/3}$, where k is a proportionality constant.

The model advocated here will, unlike its counterparts, be above bias. It is indeed universal, because not only does it apply to every piece of software, it can be used anywhere by anyone who works in software development.

With this preamble, we shall draw our notion of structural complexity from that of Pierre Teilhard de Chardin as the quality a "thing possesses of being composed (a) of a larger number of elements, which are (b) more tightly organized among themselves. In this sense, an atom is more complex than an electron, a molecule more complex than an atom. . . ." The concepts "number of elements" and "tightly organized" can be expressed in a tree structure.

Failure to qualify software complexity as structural, computational or logical will only aggravate the current confusion about what to measure or count.

Some researchers confuse software complexity and software structuredness. Some even treat structuredness as a subattribute of complexity. On the contrary, the two topics are distinct except that complexity affects structuredness. As a subject of its own, like computational complexity, software structuredness is a problem of design — it is defined at design while structural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complexity is "absolute" with a system. It is the relation of conglomerates of thoughts expressing the functional composition of the system. Structuredness is measured differently, though using the same design blueprint as for structural complexity.

An advanced understanding of structuredness based on formalized metrics holds the key to what is meant by "well-structured." Beyond, it offers us another model comparison of software productivity. We can independently verify the work of the designer.

But a potential reason for the choice of the tree as an abstracting mechanism, besides its place in mathematical tradition, is the meaning of its nodes. A node ordinarily represents an aggregate of thought.

Failure to identify completely all the nodes of a system's tree or even carefully or completely refine them is a major cause of software hazards — sporadic failures, frequent need for maintenance, prolonged and unsatisfying testing, stubborn and agonizing debugging and delayed, costly delivery.

Essentially, it represents a unit of activities or functions. In this way, a node is a central idea for processing data; it enables us to concentrate on a particular activity while postponing or "ignoring" others temporarily, only to return to them, one at a time, after "satisfactorily" completing the current node of activity.

But more important for purposes of control and management, the picture of a pattern of nodes is easy to remember in contrast to masses of lines of code or operators and operands. Such a picture gives us a sense of the structure of a system or object. The human mind remembers regular patterns or events better than amorphous or unorganized masses.

Our natural powers to handle complexity are limited, and the mind actually handles information one piece at a time. The practice of concentrating on one node before going to another is strongly emphasized by the advocates of structured programming. These ideas of modeling software metrics based on the hierarchical tree of nodes originated from my recent research in structured programming. They are a consequence of the structured revolution.

It seems that we have resigned ourselves to a complacency of structured coding, structured design and structured analysis, using chief programmer teams and walk-throughs. The true consequences of structured programming have yet to be revealed through intensive research. One such consequence is the set of empirical structure metrics (including an unbiased formula for programmer productivity) that would enable us advance and control software productivity, thus creditably earning the prestige of software engineering. Without effective metrics, software engineering lacks the technical discipline due it. The discovery and availability of effective software metrics are crucial for measures of programmer productivity.

It is false reasoning that "any method" is better than none. On the contrary, a poor method has the potential to blind or demoralize the creative search for an effective method. This is the possible impact of the several conventional unsound metrics now being used as measures of programmer productivity — from lines of code to function points; from counts of operators and operands to the hypothetical "on the scale of X," where X may be 10 or 30 or 911.

It is remarkable that although software science claims to measure algorithmic or computational complexity, it actually measures textual complexity, which has nothing whatsoever to do with programming effort, since it does not measure the complexity of computing associated with the operators and operands. It merely counts them; it does not explain how bugs are related to operators or how to use its formulas to verify a design or coding.

Of course, the controversy still rages over what to count — a defect inherited from unsound definition. This misconception of its advocates is misleading because the ability to read (and, hence, identify operators and operands) is not the ability to analyze or design or code a program. The latter are some of the factors that concern programmer productivity. Readability is less significant (except for maintenance) since a nonprogrammer can read a program; it is no wonder some researchers are using these formulas of software science to study English texts or computational linguistics.

One further benefit of the tree-node methodology is its refinability. A node as an aggregate of thoughts or activities can be refined to uncover its elementary members or subunits. This refinement can be carried out repeatedly so that eventually, the ultimate monadic functions (lowest-level units of activities) are identified in their succession of details.

Failure to identify completely all the nodes of a system's tree or even carefully or completely refine them is a major cause of software hazards — sporadic failures, frequent need for maintenance, prolonged and

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unsatisfying testing, stubborn and agonizing debugging and delayed and costly delivery.

What is more reassuring is that a well-known principle does exist for carrying out and verifying this process of refinability: the principle of inequivalence. It is common experience that the software activities of UPDATE, VALIDATE and READ are inequivalent. Each belongs to a distinct equivalence class of activities and is, therefore, representable as a node.

The most useful aspect of the model of software complexity offered here is its feedback effect on software productivity. The practice of using LOC leads to redundant coding, besides giving a false sense of largeness. By our new definition, any (average) practitioner can independently verify the measure obtained; that is, the nodes approach can rationally lead us to justify and verify the things we do. For any system, we can identify and qualify each unit of thought.

This feedback effect has some psychological, practical results. How can a software metric help us understand and produce better software? There are several answers to this question. Among them is effective control — manifesting itself best in complete refinement of nodes. The ultimate purpose of hierarchical refinement is to identify *all* the sequences of details (functions and nodes). With this measure of complexity, a walk-through session can gain added importance. There, a design blueprint will be verified for completeness of refinement, as well as for correctness of requirements specifications against the corresponding code blueprint. Each algorithm of each node may be further isolated and verified.

This is disciplined control of productivity. When these metric influences are considered for design applications, software productivity will be enhanced. The practice at some centers of complimenting a volume table of contents (Vtoc) with flowchart or decision table methodologies is a signal that the target system has not been completely refined.

In addition, this metric can provide rich information about the quality of software design. In particular, it will enable us to gain confidence about how well-structured the software design is. A simple test of a well-structured design is to have the derived blueprint correspond node-for-node with the generated blueprint of the same system.

But a more critical feedback effect is cost control. It can be argued that software cost is strongly influenced by some modes of complexity, especially structural and computational, and less significantly by logical and conceptual. The use of LOC is very crude, at best, since software size is determined by structural complexity.

Just as the cost of an electronic device is the sum of the costs of its constituent components rather than of masses of wires and resistors and capacitors, so also may software cost be seen as the sum of costs of its constituent nodes, rather than of masses of LOC or operators and operands. The number of nodes depends on the variables: Level, L, expansion number, E, and monadicity, M. For instance, the cost of an UPDATE/VALIDATE node can be established on the bases of number of refined nodes and their corresponding I/O elements.

When this principle is thoroughly grasped, the malaise that currently grips software forecasting will

By our new definition, any average practitioner can independently verify the measure obtained; that is, the nodes approach can rationally lead us to justify and verify the things we do. For any system, we can identify and qualify each unit of thought.

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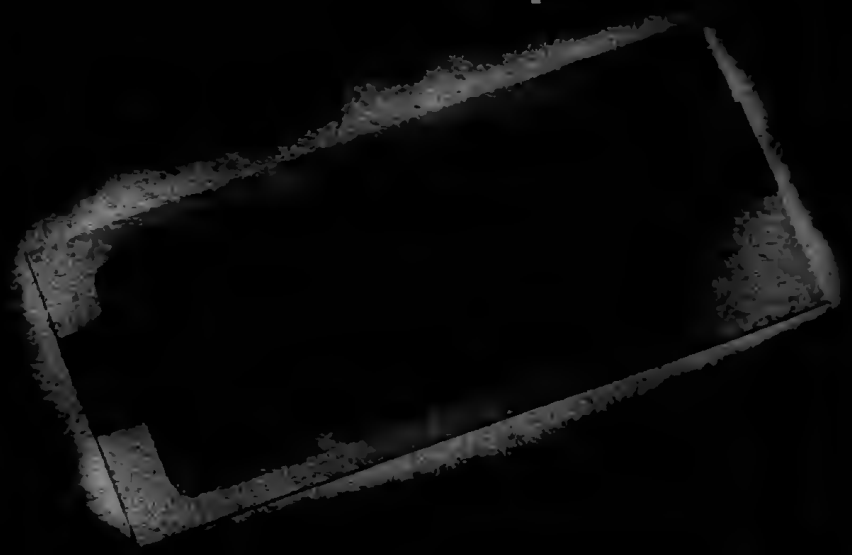

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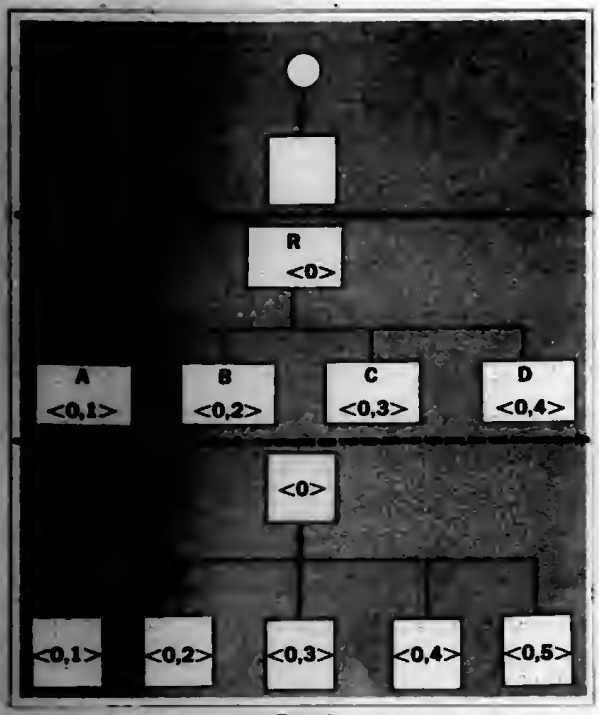

Figure 1

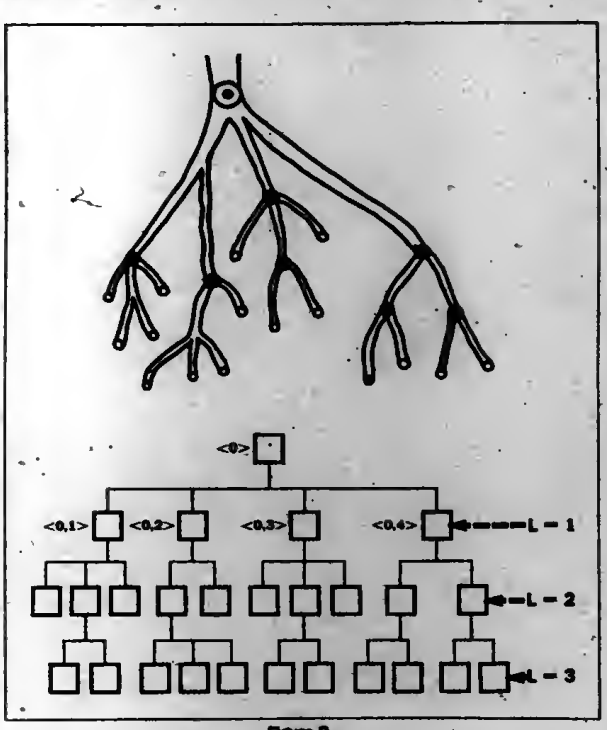

Figure 2

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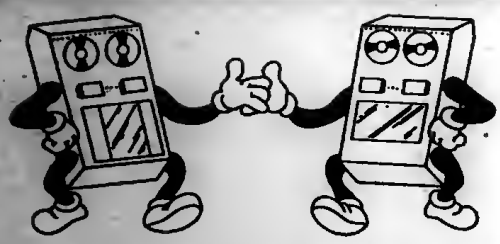

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gradually fade away. For then, we can experimentally construct hypotheses using our new software structure about the potential size and cost of a software project (in development) against some background of tentative estimate of nodes and corresponding cost assignments — perhaps emulating the methods of the Simplex algorithm. This technique can be used at the start of a project, whereas in current practice, no technique exists for software forecasting until after coding.

In this simple model for software (structural) complexity, three attributes of a tree structure are used for abstraction:

1. L — level, or the maximum of the heights of nodes above the root node. L measures the reality of deep nesting of nodes.

2. E — explosion number, or effect of rotation of branches of the root node. E measures the circumorthogonal "weight" of complexity. The explosion number we use is the sum of all nodes at level 1; and these nodes are the immediate twins of the root node.

3. M — monadicity or totality of leaves of a tree (signifying the intensity of refinement). The leaves are the only nodes without explosion numbers. M is summed through all explosion numbers. M measures the "bushiness" of the tree (system). In order to count a node exactly once, we constrain M = 1 at L = 1.

From applications experience, as the level increases (tall tree), the more complex the system and hence more difficult to design or code. The same psychological effect is experienced with E, the number of branches of the root (these are the nodes at level L = 1). Monadicity, a measure of "bushiness," imposes on as a similar effect.

These three effects in a sense multiply our intuitive feeling of complexity. Therefore, we interpret this sense of complexity as:

Image of software complexity, C = L x E x M.

Finally, using the ideas of reciprocal discussed above, we define (in terms of degrees) the "complexity" imposed on us by the system as:

Degree of software complexity, D_c = 1/C.

Simplicity is the strength of comprehension.

A good metric must somehow describe what it measures; it must give us an intuitive feeling of the object being measured.

A critical asset of this methodology is the lack of ambiguity about what to measure or count. When a design blueprint is used for measure, the nodes are explicit; but when a code blueprint of a system is used for measure, the nodes are implicit. However, they can be derived explicitly. For instance, in the Ada programming language, the following are qualified nodes at their various points of description: PROCEDURE, PACKAGE, SUBROUTINE, FUNCTION and so on. For Cobol, the Procedure Division is the root node; other nodes are section name and paragraph name. Each programming language has its own "tokens" of nodes. Moreover, for each module, we can sketch a blueprint of them. In neither language is data structure a candidate node, since the data structures are variously associated with the nodes as input and output elements.

For a software design generated or produced according to function decomposition methodology, the

Figure 3A

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Figure 4

nodes are easy to identify on the design blueprint or similarly. On the other hand, for other methodologies and including existing software, we can derive a blueprint of tree hierarchy of nodes as follows: Plot the pattern of nodes using the tips described above [Ada, Cobol and so on] by following the PROCEDURE CALLS or nestings of PERFORM labels.

In essence, if in a certain PROCEDURE CALL or PERFORM paragraph there is a PROCEDURE CALL or PERFORM statement, then the later is plotted as a child node of the former PROCEDURE CALL or PERFORM paragraph. In this way, the plot shows how the system was refined at design and how it presently operates. Each PROCEDURE CALL or PERFORM paragraph is treated as a single-entry/single-exit path. But the code blueprint can justify or refute the adherence to this structured principle. This is another feedback effect of this measure. For example, an EXIT-in-the-MIDDLE degrades structuredness.

Finally, apply the above simple formula to the derived design blueprint to compute the degree of complexity by counting L, E and M, respectively. In this way, we can measure the structural complexity of every piece of software as well as compare two or more pieces.

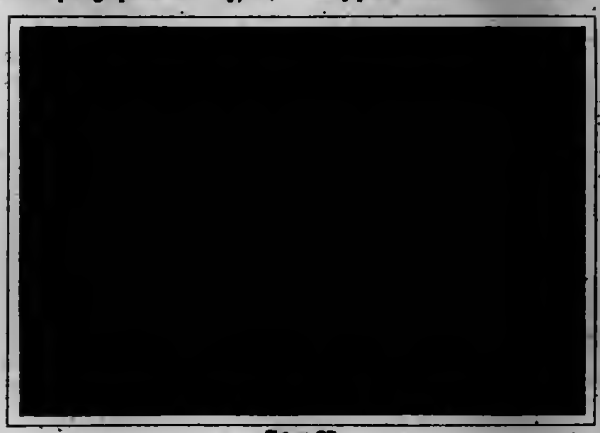

Figure 3B

This formula is unbiased, consistent, verifiable and invariant. Like structured programming, it does not depend on any programming language or computing environment or design methodology. Besides, it is simple and easy to use for both programmers and managers alike, and it does not require paperwork as do other methodologies for measuring programmer productivity. Its unequivocal elegance is that, besides giving us a picture of what is measured, it is exactly based on what we do and not on how we are disposed.

An effective metric has other desirable qualities, especially for software engineering. A good metric must somehow describe what it measures; it must give us an intuitive feeling of the object being measured. This intuitive feeling comes from the perception of the nature of the object — more specifically, its structure. In other words, we must first understand the structure of the entity being measured. There is no way to measure anarchy.

But a more profound desirable attribute of an effective metric is the potential for comparison. If, for instance, a metric measures distance, it must permit us to confirm that Boston is farther from Chicago than Buffalo. If it measures electric power, it must show consistently that over the same time interval, a steel manufacturing plant consumes more power than a candy store. The metric proposed here for software complexity satisfies this comparison criterion because the total number of nodes, N, depends on L, E and M. Any variation in any factor reflects on D_c. Therefore, we can compare two or more pieces of software.

Furthermore, the metric enables us to know equivalent (or isomorphic) systems, irrespective of their types of application or programming language. Two systems are isomorphic if they have the same number of nodes per corresponding (levelwise) parent. A metric that does not guarantee formal comparison is simply useless.

If two pieces of software differ in structural aggregation, the costs associated with them also differ in economic evaluation. Software costs remain a critical driving force for research into software metrics. Such metrics must, therefore, have the intrinsic potential for comparing software. The potential for comparison is mutually associated with the need for universalism of application.

These metrics founded on structured programming principles have the best hope of universal acceptance since structured programming is independent of programming languages and environments. Its basic principles are invariant.

We shall give two categories of examples — one using the original hierarchical tree (design) blueprints; and the other (examples 3 through 5) the derived hierarchical tree (from code) blueprint.

Example 1. One-level tree. Let us consider three different cases.

Case A (Figure 1A): The tree has only one node. $L = E = M = 1$. Therefore, $C = 1$ and $D_c = 1/C = 1$. This is a very rare case, showing the least complexity.

Case B (Figure 1B): The tree has four nodes. $L = 1$; $E = 4$; $M = 1$ (by constraint; this approach avoids counting any node twice for E and M). Therefore, $C = 1 \times 4 \times 1 = 4$; and $D_c = 1/4 = 2.5 \times 10^{-1}$.

Case C (Figure 1C): The tree has five nodes. Thus, $L = 1$; $E = 5$; $M =$

Figure 5A

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Figure 5B

1. Therefore, C = 1 x 5 x 1 = 5; and $D_c = 1/5 = 2 \times 10^{-1}$.

Example 2. Multilevel tree. In Figure 2, L = 3, E = 4 and M = 4 + 4 + 4 + 4 = 16. Therefore, C = 3 x 4 x 16 = 192 and $D_c = 1/192 = 5.208 \times 10^{-3}$.

The only practical hint for deriving hierarchical trees from code blueprints is a fair adherence to good structured coding and breaks in boundaries of thought as expressed in the statement instructions.

Example 3: Derived tree of a Cobol module. In this example, only the structure labels and key control instructions are excerpted (Figure 3A). The derived hierarchical tree is Figure 3B.

Using the formula, L = 3, E = 5 and M = (2) + (3) + (4) + (5) = 14. Therefore, C = 3 x 5 x 14 = 210; and $D_c = 1/210 = 4.76 \times 10^{-3}$.

Example 4: Derived tree of an Ada module. The structure of Ada modules is a classic style of node abstraction. Procedure, package, function, subprogram, task and so on are valid candidates for nodes. Essentially, the tree representative of the Ada module is simply a natural derivative of the generated hierarchical abstraction, provided it is properly logically organized.

Figure 4 is a sample Ada module (from *Ada Programming, an Introduction*, by Henry Ledgard, 1981), and Figure 1B is its equivalent derived tree. Notice each procedure with its begin-end constitutes a node; also, the first declaration of procedure (PRICE_LIST) is the root node to these other procedures. The annotated nodes are, by procedure:

<0>: Root node, R = PRICE_LIST.

<0,1>: Explosion No. 1, A = PRINT_TITLE_INFO.

<0,2>: Explosion No. 2, B = PRINT_COL_HEADERS.

<0,3>: Explosion No. 3, C = PRINT_PRICES.

<0,4>: Explosion No. 4, D = MAIN_PROGRAM.

Since the derived tree is as in Figure 1B, D_c is as computed in Example 1, Case B. This is another feedback effect, this time obtained from the principle of isomorphism. The design (if possible, derived) blueprints of two or more modules or systems have the same structural form, irrespective of the type of application (including programming languages).

Note: In some modules, each maximal subtree may be refined into other child subtrees. In this case, the complexity grows, but the computational formula remains invariant.

Example 5: Structured Fortran. Fortran, much criticized for inflexibility to structuredness, can nevertheless benefit from this new philosophy. The derived hierarchical tree in Figure 5B is based on a coded example from Figure 5A (*Fundamentals of Structured Programming Using Fortran With SF/K and WATFIV-S*, by R.C. Holt and N.P. Hume, 1977).

The key words: DO, IF, DOWHILE, PRINT, READ, WRITE and so on are the abstracted nodes.

A useful aid to identifying twins from the same parent node is to use correct structure coding — all twins are aligned on the same column, assuming well-structured coding. This technique also applies to many other scientific languages. This is one more example of feedback from this metric philosophy — an improvement over structured coding. From Figure 5B, the following measures are true: L = 5; E = 4; M = 0 + (6) + 0 + (4) = 10. Therefore, C = 5 x 4 x 10 = 200; $D_c = 1/200 = 5.0 \times 10^{-3}$.

About the author

***Lem O. Ejiogu** is a consultant and researcher with special interest in structured programming and software metrics. He has developed and introduced four original metrics for software engineering. Ejiogu is the author of* Effective Structured Programming, *published by Petrocelli Books, Inc. in Princeton, N.J. Presently, he is writing a text titled* Software Engineering: Design and Discipline. *He is the director of the consulting firm Lemcomm Softgram in Chicago.*

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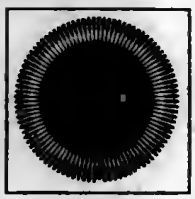

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Omninet goes low-cost

SAN JOSE, Calif. — Corvus Systems, Inc. has introduced two product lines designed to create lower cost versions of its Omninet local-area network for personal computers.

Omninet is the most popular micro local-area network, according to Corvus, which claims an installed base of more than 7,500 networks serving over 70,000 computers and peripherals.

Corvus' new Omnishare network product allows an IBM Personal Computer or Personal Computer XT hard disk drive to emulate a Corvus disk system and create an inexpensive Omninet. The firm's new Omnidrive Winchester drives, expected to replace most of the Corvus line of hard disk drives, include built-in local-area network interfaces.

Omnishare permits users to decide how much space on the Personal Computer XT disk will be dedicated to the host computer's stand-alone applications and how much space will be shared by other Personal Computers and XTs on the network, Corvus said. The emulator program runs as a background task on the host computer, allowing an application program to be run in the foreground.

Omnishare features most characteristics of a standard Omninet, except that disk storage is limited to that of a single XT, according to Corvus. The Omnishare package, selling for $795, consists of emulation and Constellation II software, an XT transporter card, Omninet cable and a manual. Shipments are expected to begin next month.

The firm said its new 5¼-in. Winchester drives "are the first disk drives designed specifically for use with a net-

See CORVUS page 76

Compupro adds system

HAYWARD, Calif. — Compupro, Inc. has announced System 816/F, a multiuser Intel Corp. 80286-based system that Compupro claims is twice as fast as those based on Intel 8086 and Motorola, Inc. 68000 chips.

The system features Intel's 80286 and 80287 microprocessors, 512K bytes of random-access memory (expandable to 1M byte), 12 serial ports, one Centronics Data Computer Corp. printer port, one parallel port, 1.5M bytes of hard disk storage and Digital Research, Inc.'s CP/M 86 and MP/M 86 operating systems. System 816/F costs $14,995, and first shipments begin this month.

Initially, the company is targeting sales to firms developing products for 80286-based systems. "The system will be used primarily for the development of new systems," said William Godbout, Compupro's president.

The company plans to add Unix capabilities to the product. "Currently, there isn't a version of Unix for the 80286," Godbout said. "It's a chicken-or-egg situation. Software companies need hardware to develop the operating system, and hardware companies need the software for their machines.

"When Digital Research develops Unix 5, sometime later in the year, we will offer it to our users," Godbout added.

System 816/F can easily support 10 users, according to the vender. "One could go above that depending on the system needs, but it will not support 25 users," Godbout said. Users can tie stand-alone CP/M machines into the system.

Godbout estimated that the company will sell about 1,000 systems this year.

INSIDE

Printers/Plotters/70
Board-Level Devices/70
Auxiliary Equipment/70
Software/70

Electronic mail net lets micro managers share data

By Edward Warner
CW Staff

BOSTON — The Micro Manager's Association (MMA), a 225-member group based here, last month went on-line with its Executive Communication Network (ECN), an electronic mail system that will allow members to share information about microcomputers.

The ECN will provide users with an electronic mailbox and access to a general bulletin board and a special bulletin board covering their particular industry, according to MMA founder Marty Butler. Users will reach the ECN through their microcomputers and post their questions about micros, peripherals, local-area networks and micro software on the appropriate bulletin board. They will receive responses from others on the network via their electronic mailbox.

The ECN, which costs $150 annually to join, fits the MMA's purpose of "preventing people from having to reinvent the wheel" by letting managers working with micros share their knowledge, Butler said. Most MMA members, he noted, are known as vice-presidents for information systems or MIS directors, not as microcomputer managers, but they still are responsible for integration and management of the small computers in their firms.

Butler, a former software salesman, formed MMA in July 1983. The group now includes members from 85 Fortune 500 corporations, he said.

The Boston chapter, the largest, has no dues, but derives its funding from sponsoring conferences and from the ECN membership fee. Branches of the association also exist in New York and Los Angeles. The New York chapter has annual dues of $24, and the Los Angeles chapter charges $2 per meeting, Butler said. A Detroit chapter also is being formed.

The MMA is planning its first national conference, "Microforum '84," for June 14 in New York. The meeting, he said, will bring micro hardware and software vendors face-to-face with a panel of users representing the finance and insurance industries. "We want to let [vendors] know where the Fortune 500 stands on data

See MMA page 76

MICRO BITS/THOMAS MADRON

Should you buy a multiuser system or a local-area network?

When multiple microcomputer workstations with resource sharing are required, should we buy a multiuser system or link several micros with a local-area network? No answer to this question is completely satisfying, but there are some issues we can consider.

There are two main types of multiuser systems. One consists of a relatively powerful micro supported with a multiuser operating system, such as Unix, which allows concurrent access by more than one user. Alternatively, several single-user micros — each on a single board — can be packaged together with a single hard disk and related support services in a centralized system accessed through multiple terminals.

The alternative to these methods is to link several single-user microcomputers with a local-area network, one that allows a high degree of connectivity among nodes with limited geographic scope. One example is Ethernet, originally developed by Xerox Corp. and currently marketed by several manufacturers.

Frequently, the impetus for the acquisition of either a multiuser micro system or a network of micros is the need for several workers to share data, communicate through electronic mail or make more effective use of high-cost peripherals.

Impinging on the decision, especially in a large organization, are requirements for access to central computing facilities or integration in a larger network. Problems to be confronted include response time; the presence or absence of a single point of failure; and the impact of a failure on the system, centralized or decentralized support and cost.

In a recent report, Strategic, Inc. of San Jose, Calif., gave the allegedly higher cost of several micros supported by a local-area network as a reason for choosing a multiuser, multiprocessor system. Strategic quite rightly pointed out that an IBM Personal Computer/local-area network solution is not the only one that should be considered.

However, the recent introduction of the Personal Computer Cluster Program suggests the conceptual direction being taken by IBM. Certainly other micro manufacturers are making local-area networks available. Meanwhile, independent makers of these nets are scrambling for the micro market.

The local-area network marketplace includes baseband manufacturers (such as Corvus Systems, Inc., Datapoint Corp. and Xerox) and broadband manufacturers (such as 3M Corp. and Sytek, Inc.), with broadband suppliers in something of a catch-up race. All of these manufacturers either have personal computer products in place or are attempting to get such products out the door. The broadband local-area networks are especially appropriate in large organizations where the problem is connecting not only micros but minis, mainframes, terminals and a variety of other devices.

To clarify the local-area networks multiuser issue, we must remember two reasons why large organizations acquire micros: to boost productivity and to reduce reliance and resource consumption on central mainframes.

When micros are fully distributed, they should not only lead to pro-

See NETS page 76

Programming tools unleashed for Intel-based systems

NORWOOD, Mass. — Four programming tools designed for use in Intel Corp.'s 8086/8088-based systems running under Microsoft, Inc.'s MS-DOS, IBM's PC-DOS and Digital Research, Inc.'s CP/M 86 have been introduced by Phoenix Software Associates Ltd. The packages reportedly include a full screen text editor, a dynamic debugger, an object module linkage editor and a library manager.

P-Mate86 is a full screen, single-keystroke editor with automatic disk buffering for backward and forward paging; 10 auxiliary buffers that can be edited individually or used as scratch pads for cut-and-paste operations; horizontal scrolling for editing lines up to 250 characters long and a macro command language, according to the vendor.

P-Mate86 also offers automatic word wrap, text formatting, global or local setting of margins and tab stops and indents and can be configured for most popular video terminals or memory-mapped displays, the company said.

P-Fix86, Phoenix Software's symbolic debugger for MS-DOS, features windowed full screen display, in-line assembler and test evaluation at break points. The debugger can load the map produced by the P-Link86 linkage editor and uses the symbols and line numbers within the program under test. It is said to allow the data display to be interchanged with the screen of the program under test and provides windows for program data and file examination.

P-Link86 is a linkage editor that handles output from Microsoft and IBM compilers and assemblers, as well as others such as Lattice, Inc. or Computer Innovations, Inc.'s C. Overlays may be specified, with no modification to the applications program, to reduce program memory requirements and may be combined into one or more disk files, the company said.

P-Lib86, an object library manager included as part of the P-Link86 package, handles libraries built according to the Intel or Microsoft format. P-Lib86 can build libraries from scratch, delete modules from existing libraries, merge libraries and produce cross-reference listings, the company said.

Prices for the Phoenix software programming tools are P-Mate86, $225; P-Fix86, $245; P-Link86 (including P-Lib86), $395; and P-Lib86, $125.

More information is available from Phoenix Software Associates at Suite 260, 1420 Providence Highway, Norwood, Mass. 02062.

SourceTools Increases
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Etherseries enhanced, price cut

MOUNTAIN VIEW, Calif. — 3Com Corp. has announced one price reduction and two enhancements to products in its Etherseries.

The price of Etherlink, the company's Ethernet interface and user software for personal computers, has been reduced from $950 to $795.

Ethershare software now supports a single IBM Personal Computer as both a network server and workstation; a dedicated server is no longer necessary.

A new Etherstart product, a chip that is inserted onto a networking board, permits an IBM Personal Computer to function on the network without a local disk drive and controller.

The Ethershare software is priced at $595; the Etherstart chip costs $100. All products are available immediately, the company said.

More information is available from 3Com, P.O. Box 7390, 1390 Shorebird Way, Mountain View, Calif. 94039.

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JUNE.

Microcomputers.
How they've changed the workplace.
What's new in networks, security, and micro-to-mainframe links.
Closes May 4.

AUGUST.

Applications Software.
A look at the real issues.
Productivity. User-friendly vs. ease-of-use. Plus plenty of product reviews.
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Workstations. We explain the alternatives to microcomputers, addressing important topics like cost-effectiveness, compatibility and upgrades.
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TI options allow Professional to talk to IBM CPUs

By Paul Korzeniowski
CW Staff

HOUSTON — Introducing optional communications products that allow its Professional microcomputer to talk to IBM mainframes, Texas Instruments, Inc. hopes to loosen the stranglehold that the IBM Personal Computer holds on the Fortune 1,000 market. "The Professional has been designed to work in IBM's sizable installed base," said Jerry Rycaj, Professional product marketing manager.

Last month, Texas Instruments announced Professional enhancements that include a coaxial interface for IBM 3278 and 3279 display terminal emulation, a 3270 Systems Network Architecture software package to mimic IBM 3276 display stations and a 3101 terminal emulation package.

IBM communication protocols will play a key role in future product developments, according to Steve Beverian, product manager for the Professional. "We will develop products to emulate other 3200 series products," he added.

The company is selling the communications products through retail, value-added reseller and direct sales channels. "Most of our retailers have a direct sales force calling on large accounts," Rycaj said. "Our [value-added resellers] target specific vertical markets."

Rycaj listed three reasons why a large company would buy the Professional rather than the IBM Personal Computer: better graphics, a well-designed keyboard and easy expansion capability. "The Professional uses the same chassis for expansion, something that the IBM Personal Computer does not do," he noted.

Rycaj claimed that a number of large companies have signed volume purchase agreements with Texas Instruments, but refused to list specific customers.

SYSTEMS

KAYPRO CORP.
Kaypro 2 price cut

Kaypro Corp. has announced that the price for the Kaypro 2 has been cut from $1,595 to $1,295.

The Kaypro 2 features two double-density disk drives with 400K bytes of storage; a 9-in., 80-col. by 24-line screen; Zilog, Inc.'s Z80 microprocessor; and Digital Research, Inc.'s CP/M operating system, the vendor said. The microcomputer bundles Perfect Software, Inc.'s Perfect Word, Perfect Filer and Perfect Calc software. Users can have Micropro International's Wordstar word processing program instead of Perfect Word.

Kaypro, 533 Stevens Ave., Solana Beach, Calif. 92075.

PERTEC COMPUTER CORP.
Model 4210

Pertec Computer Corp. has introduced Model 4210, a microcomputer that uses Pick & Associates, Inc.'s Pick operating system. The system runs Pertec's Sabre software, a series of application packages designed for Pick.

Model 4210 features 256K bytes of random-access memory (RAM), a 10M-byte hard disk, a Motorola, Inc. 68000 microprocessor, four serial ports and an 800K-byte floppy disk drive.

Options include upgrading to a multiuser Model 4220, 1M byte of RAM, 80M bytes of Winchester disk storage, 12 serial ports and a streaming cartridge tape drive, according to the vendor. Model 4210 reportedly can be part of a 36-device network.

Model 4210 costs $9,400.

Pertec Computer, 17112 Armstrong Ave., Irvine, Calif. 92713.

POLYMORPHIC SYSTEMS, INC.
Poly 8/16

Polymorphic Systems, Inc. has announced a single-user, dual-processor microcomputer that utilizes Intel Corp.'s 80186 microprocessor and Digital Research, Inc.'s Concurrent CP/M 86 operating system.

A spokesman said Polymorphic's Poly 8/16 micro features a two-board set that includes an 8-bit Zilog, Inc. Z80 processor with 64K-byte random-access memory (RAM) running Digital Research's CP/M 80 on the system master card, plus a 16-bit 80186 with 256K-byte RAM running the multitasking Concurrent CP/M 86 on the slave board.

The Poly 8/16 micro includes the Z80 master card

Continued on page 70

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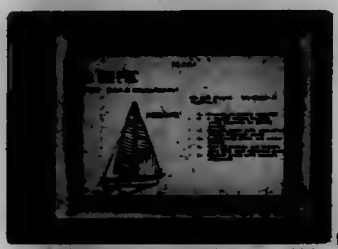

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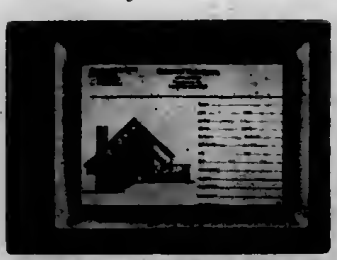

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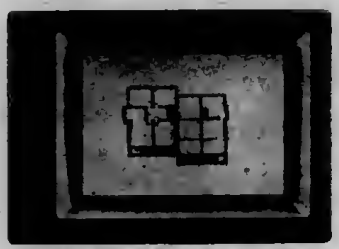

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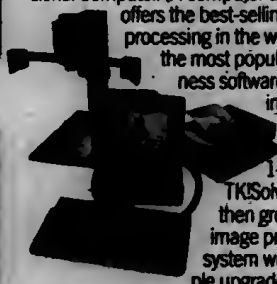

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MICROCOMPUTERS

Continued from page 68

and 32128 slave card with RAM on an S-100 motherboard, one half-height, 5¼-in. floppy disk drive with 500K bytes storage, four RS-232C/RS-422 serial ports, two parallel ports, an adjustable terminal with 14-in. monochrome display and detached keyboard. Prices for the Poly 8/16 start at $4,495.

Polymorphic Systems, 460 Ward Drive, Santa Barbara, Calif. 93111.

PRINTERS/PLOTTERS/PERIPHERALS

INFORUNNER CORP.
Riteman printers

Inforunner Corp. has announced four dot matrix, bidirectional, logic-seeking printers.

The Riteman line of printers are portable and fit in standard 3-in. briefcases, according to the company.

The Riteman Plus prints 120 char./sec in 66 character modes and is compatible with the Epson America, Inc. MX-80FT, according to the vendor.

The Riteman Blue Plus prints 140 char./sec in 128 character modes and is compatible with IBM's Graphics Printer, Epson RX-80FT and Epson MX-80FT software, a spokesman said.

It reportedly prints in elite pitch mode and is equipped with quiet mode and proportional spacing.

The Riteman II is designed to print 160 char./sec in 256 programmable character modes with Epson FX-80 software compatibility. In addition, it has an 8K-byte buffer, quiet mode and proportional spacing, the spokesman said.

The Riteman 15 Printer features a 15-in. carriage and adjustable tractor feed. It is said to print 160 char./sec in 256 programmable character modes and to offer Epson FX-100 software compatibility, the vendor said.

Available now, the Riteman Plus is priced at $399. The Riteman Blue Plus is scheduled for March availability at a price of $499. The Riteman II is scheduled for April availability at $599. The Riteman 15 is scheduled for availability in March at $799, according to the vendor.

Inforunner, 1621 Stanford St., Santa Monica, Calif. 90404.

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BOARD-LEVEL DEVICES

INTEGRATED SOLUTIONS, INC.
CPU, memory card

Integrated Solutions, Inc., has introduced a VME bus-compatible, Motorola, Inc. 68000/680101-based CPU and memory card. The CPU reportedly allows up to 16M bytes of physical memory to run with no wait states at 12 MHz.

The CPU also features two programmable serial ports, one with modem control. The memory management unit is said to support an 8M-byte logical process and up to 16M bytes of physical memory.

The CPU is available for $2,200, and the memory card is available for $1,695, with 512K bytes of memory, according to the vendor. Discounts are reportedly available for quantity purchases.

Integrated Solutions, 1350 Dell Ave., Campbell, Calif. 95008.

AUXILIARY EQUIPMENT

DEMCO ELECTRONICS
Graphics Tool Kit

Demco Electronics has announced the Graphics Tool Kit, which is said to be a complete hardware and software package for interactive graphics generation.

A vendor spokesman said the system is compatible with all Apple Computer, Inc. Apple II and compatible microcomputers, with output to a dot matrix printer. The proprietary hardware allows users to design on a movable screen with resolution of 640 horizontal dots by 768 vertical lines.

The main software package of the Graphics Tool Kit is menu-driven, and it manipulates vector shapes, displays fonts, draws lines and plots points.

The spokesman said the system can generate graphs, charts, sheet music, floor plans, circuit diagrams, parts layouts, logic diagrams, mechanical drawings, stylized logos and lettering.

The Graphics Tool Kit costs $495.

Demco Electronics, 10516 Grevillea Ave., Inglewood, Calif. 90304.

SOFTWARE

KEY SOLUTIONS, INC.
Databurst

Key Solutions, Inc. has introduced Databurst, an IBM Personal Computer program generator with a full screen processor.

According to the vendor, the Databurst option enables programmers to expand and test Basic programs using the interpreter, then compile them with no changes. The compiler support is loaded into memory once and becomes an extension of the operating system.

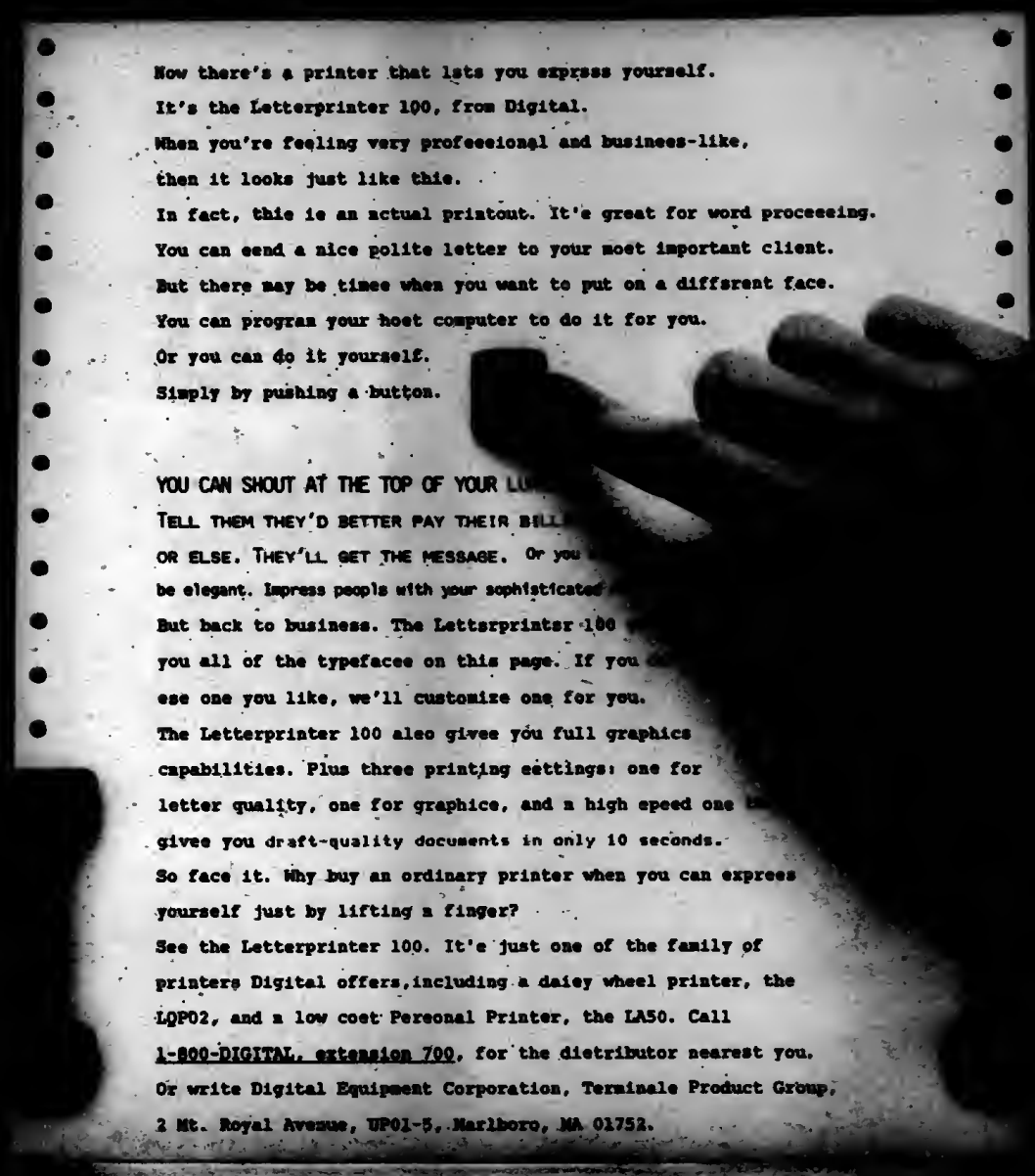
Because it is no longer hosted by Basic, the compiler support reportedly simplifies interprogram communication.

Databurst is priced at $225. The Databurst compiler option is available for $40, the vendor said.

Key Solutions, P.O. Box 2297, Santa Clara, Calif. 95055.

See TOOLS page 72

Change your face with one finger.



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Or write Digital Equipment Corporation, Terminals Product Group,
2 Mt. Royal Avenue, UP01-5, Marlboro, MA 01752.

digital

TOOLS from page 70

AUTODESK, INC.
Autocad enhancement

Autodesk, Inc. has enhanced its Autocad software for precision drawing applications on microcomputers. The Autocad program reportedly permits users to perform many functions of computer-aided design.

The enhanced Autocad program reportedly includes a break command to permit partial deletion of drawing elements, a freehand sketch mode and alternate arc/circle specifications.

Autocad runs on the IBM Personal Computer and Personal Computer XT; the Victor Technologies, Inc. Series 9000; the Zenith Data Systems Z100; the NEC Information Systems, Inc. APC; the Eagle Computer, Inc. Eagle Personal Computer and 1600 models; Digital Microsystems, Inc. models 100 and 100 Plus; Texas Instruments, Inc. Professional; Digital Equipment Corp. Rainbow; and Compaq Computer Corp. Compaq.

Autocad is available for $1,000 in a basic package and for $1,500 in a package that includes advanced drafting extensions, according to the vendor.

Autodesk, Suite B20, 150 Shoreline Highway, Mill Valley, Calif. 94941.

A+ SOFTWARE, INC.
Under-Control; Gantt-It

A+ Software, Inc. has announced two software programs for file management and project control for IBM Personal Computers or Personal Computer XTs operating under IBM's PC-DOS or Microsoft, Inc.'s MS-DOS operating systems.

Under-Control is a file management program that reportedly features automatic entry screen generation, sorting, report writing, record selection and totaling functions.

Gantt-It, a project control and cost allocation program, is an optional extension of Under-Control. It reportedly features task tracking and cost allocation. With Gantt-it, charts can be printed up to 999 characters wide.

Under-Control sells for $125. Gantt-It and Under-Control together cost $195.

A+ Software, 16 Academy Drive, Shenendehoa, N.Y. 13152.

CONCEPT OMEGA CORP.
Word Concept

Concept Omega Corp. has introduced Word Concept, a multiuser word processing program that runs under Microsoft, Inc.'s MS-DOS and Xenix, Unix and Scientific Management Corp.'s Thoroughbred operating systems.

Word Concept features menu-driven input, on-line help screens, full screen editing and function key control, the vendor said.

The program is written in Microsoft's Business Basic, supports three IBM Personal Computers and interfaces with any program using Business Basic, according to the vendor.

Word Concept costs $495.

Concept Omega, P.O. Box 6701, Bridgewater, N.J. 08807.

LEADING EDGE PRODUCTS, INC.
Mail List Manager

Leading Edge Products, Inc. has announced the addition of an integrated Mail List Manager to its Word Processing software.

The package adds advanced personalized document capability to the Word Processing package, as well as the ability to select a group of records.

The Word Processing package was designed for use with the Leading Edge Personal Computer, the IBM Personal Computer or Personal Computer XT and other compatibles.

Available this spring, Word Processing with Integrated Mail List Manager is priced at $495, according to the vendor.

Leading Edge Products, 55 Providence Highway, Norwood, Mass. 02062.

SOFTWARE DIGEST, INC.
The Ratings Book

Software Digest, Inc. has published the first edition of *The Ratings Book*, a series of publications comparing and rating various microcomputer programs, with each issue focusing on a single category of software.

This initial offering is an evaluation of 30 word processing programs written for

Continued on page 78

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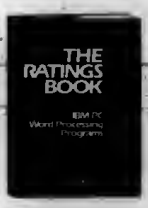

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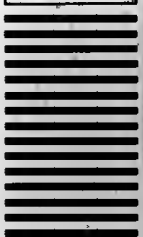

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MICROCOMPUTERS

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the IBM Personal Computer.

In addition to numerical ratings based on multiple testing, the book also contains 50 comparative ratings charts, summaries of the test results for each program and 100 screen pictures.

The Ratings Book: IBM PC Word Processing Programs costs $14.95.

Software Digest, One Rhinewood Road, Wynnewood, Pa. 19096.

NBI, INC.
Three software packages for Onyx 2000

NBI, Inc. has announced three business software programs for its Onyx 2000 Personal Computing Work Station.

The programs — Microsoft, Inc.'s Multiplan electronic spreadsheet and Gwbasic programming language and Ashton-Tate's Dbase II data base management system — are being offered as a clustered package that enables operators to share a program library, according to a spokesman.

The Onyx 2000 workstation features a standard 128K bytes of user memory, a 14-in. screen for text and graphics display and Microsoft MS-DOS compatibility.

Prices for the software vary, depending on the configuration of the system and the combination of software packages. The base price of the Onyx 2000 is $8,595.

NBI, P.O. Box 9001, Boulder, Colo. 80301.

TRILLIAN COMPUTER CORP.
Shell for Lotus 1-2-3

Trillian Computer Corp. has introduced a program said to permit its Visuall software to run in conjunction with Lotus Development Corp.'s Lotus 1-2-3 spreadsheet program.

The interface program, called a shell, reportedly permits Lotus 1-2-3 users to use Visuall, which displays a window-menu of commands to guide new users and allow them to operate their applications software at the task rather than command level.

Trillian's Lotus 1-2-3 shell is available for $49.95. A shell for Micropro International Corp.'s Wordstar program is also available for $49.95. Visuall costs $99.95.

Trillian Computer, P.O. Box 481, Los Gatos, Calif. 95031

TEXAS INSTRUMENTS, INC.
Multimate

Texas Instruments, Inc. has announced its own version of Software Systems' Multimate word processor software designed for the TI Professional computer.

According to the vendor, the package includes features such as Merge Function, a Spell/Checker Corrector with an 80,000-word dictionary and the ability to perform keystroke procedures and conversion capabilities for file integration.

Available April 1, Multimate has a suggested retail price of $495.

TI, P.O. Box 402430, Dallas, Texas 75240.

DATA MANAGEMENT ASSOCIATES, INC.
Magic MPS

Data Management Associates, Inc. has introduced a programming language called Magic MPS which it claims improves programmer productivity by up to 10 times.

Magic MPS maintains traditional language philosophies to create application programs without the need of a run-time package, a spokesman said.

Magic MPS/80, for all Digital Research, Inc. CP/M systems, is priced at $795. Magic MPS/86, for CP/M 86 and Microsoft, Inc. MS-DOS systems, is priced at $995.

Data Management Associates, P.O. Box 4340, Wilmington, Del. 19807.

LOGICAL SYSTEMS, INC.
Assembler source code

Logical Systems, Inc. has introduced assembler source code for the firm's LS-DOS/TRSDOS 6.2X operating system.

The publication is titled "The Source" and is published in three bound volumes: "The System," "The Libraries" and "The Utilities," the vendor said.

Each volume is available for $90, or $249 for the complete set, with delivery set for June.

Logical Systems, 8970 N. 55th St., Milwaukee, Wis. 53223.

See TOOLS page 76

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BYRING RESEARCH INSTITUTE, INC. Pdos Pascal

Byring Research Institute, Inc. has introduced a multiple-pass Pascal compiler that generates assembler text for Motorola, Inc.'s MC68000 microprocessor.

Pdos Pascal is designed as a superset of the International Standards Organization standard to allow for systems programming with Pdos, a vendor spokesman said.

Since native code is generated with Pdos Pascal, faster program execution is possible for real-time applications, according to the spokesman.

Pdos Pascal is said to enhance the multitasking facilities of Pdos by allowing for subtasks within each Pascal program.

Pdos Pascal can be ported to any 68000-based microcomputer and is available on the Motorola VME/10 and the Sage Computer Technology, Inc. Sage 2 and Sage 4 microcomputers, according to the spokesman for the vendor.

The Pdos Pascal program is priced at $550, the vendor said.

Byring Research Institute, 1455 W. 820 North, Provo, Utah 84601.

CORVUS from page 65

work of microcomputers and offer improvements of up to 40% in throughput." The built-in network disk server circuitry can save users nearly $1,000, Corvus stated.

Omnidrive systems will be offered with 5.5M-, 11.1M-, 16.6M- and 45.1M-byte formatted storage capacity, with suggested prices of $1,995, $2,495, $3,195 and $4,995, respectively. (These prices exclude the Constellation II net-work software, which sells at $395 for Apple Computer, Inc. micros and $495 for other models.) The systems will be available this month for personal computers from Apple, Corvus, Digital Equipment Corp., IBM, Texas Instruments, Inc. and Zenith Data Systems Corp.

Corvus is located at 2100 Corvus Drive, San Jose, Calif. 95124.

MMA from page 65

bases [and] micros and hopefully stimulate the imagination of the vendors," he said.

The ECN is based on a Zenith Data Systems Corp. Z100 microcomputer. Users can access the system with any microcomputer with a modem and appropriate communications software, Butler said. He expressed hopes the ECN will eventually link the membership for teleconferencing. An organizational newsletter is also being considered, he said.

Further information on MMA membership is available from the Micro Manager's Association, located at 80 Boylston St., Boston, Mass. 02116.

NETS from page 65

ductivity improvements, they also should create a group of more computer-literate employees, ultimately requiring less support than would be the case with even a small centralized system.

But if instead of a micro on a person's desk there is only a terminal into a "central" multiuser micro system, then only the level of centralization has been reduced — not centralization itself.

The system may not be as remote as the organization's mainframe, but it requires many of the same support elements: maintenance, backup, programming support and a host of related services. Yet the multiuser micro is likely to be in an organizational environment without any of the support provided by a central mainframe facility. At the same time, there is little incentive for users to learn any more about the workings of the multiuser micro than they do about the central mainframe system.

Thus, from an organizational perspective, the multiuser micro may end up having all the disadvantages of the central mainframe system with none of the advantages.

The initial cost of a local-area network may indeed be somewhat higher than a multiuser system supporting the same number of users. The other considerations discussed, however, may prove more important than entry costs.

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COMPUTER INDUSTRY

Metamorphosis marks NCR's centennial

By Peter Bartelik
CW Staff

Marking its centennial this year, NCR Corp. is, in a sense, the grandfather of the information processing industry, and until recently, many people did regard it as a very senior citizen — old and tired, slow and plodding. But in 1983, NCR broke out of its cocoon, building on changes implemented over the past decade to release a slew of new products and pursue new endeavors.

Now NCR proudly proclaims it is "Celebrating the Future." That future is to be based on a relatively new management team, new products and, perhaps most important, new ideas.

For 90 years, NCR was the National Cash Register company, completely dominating U.S. and international markets with its electromechanical cash registers, found in just about every corner store in the country, and accounting machines. But it lost its hold on that market with the proliferation of electronic competitors.

In 1973, William S. Anderson was tapped from the company's Far East operations and focused the company's goals on the information processing business it had begun in the late 1960s. In 1976, Anderson lured Charles E. Exley Jr. away from a successful 22-year career at Burroughs Corp. to become president of NCR and Anderson's heir apparent. Last year, Exley was named chief executive officer in anticipation of Anderson's coming retirement this year, and the passing of the purple coincides with a renewed vigor at the company.

The company never had many problems with turning a profit, but it did have problems keeping up with the revenue growth in the information industry, growing in the low single digits and bottoming out at 3% in 1982, while other players grew at a rate averaging about 14%. Coming out of the recession last year, NCR boosted revenues by 6%; this year, spurred by new products and the economic recovery, NCR is expected to post revenue growth of 15% or better.

"Good growth this year will not demonstrate that we have learned how to be a very high-growth company, because it is coming off two severe years of recession in our industry," Exley said during a recent interview. "The key to my way of thinking is that we have to be constantly exploring new opportunities and new applications of the products that we specialize in, and we have to be prepared to offer, to apply the things we know how to build to new markets regularly. That is something that in our history we have not done. We have brought new technology to the same markets, but we have not addressed new markets. So the way we're going to do that is we are going to be successful in addressing new market opportunities."

The company has targeted a staggering number of opportunities it hopes to ex-

See NCR page 78

Computervision Corp. expresses surprise at the amount of damages being sought by Perkin Elmer Corp. in a lawsuit over a long-standing patent dispute/**81**

INSIDE

■ Two public opinion researchers warn that election-year industrial policies being developed by the two major political parties may be rejected by voters if those policies seem to be government intervention rather than government-business cooperation/**79**

■ Delayed installations are cited as one reason why Rolm Corp.'s quarterly revenues will not meet Wall Street expectations/**80**

■ Members of Lotus Development Corp.'s advanced development group start up Prelude Development Corp. and agree to license artificial intelligence products to their former company/**84**

■ Ashton-Tate reports revenues and profits in 1983 were both up more than 200% over the previous year/**92**

AT&T lacks DP strategy, Adapso told

CW AT ADAPSO

By Robert Gatt
CW West Coast Bureau

DALLAS — The lack of a clear-cut strategy will make it very tough for AT&T to compete against IBM in the computer services industry, the Association of Data Processing Service Organizations, Inc. (Adapso) was told here recently.

Speaking at Adapso's 60th Management Conference, Esther Dyson, president of Edventure Holdings, Inc., a New York-based consulting firm, said AT&T will have a hard time competing in an unfamiliar marketing environment.

"AT&T does not have a clear strategy in sectors such as local-area networks, and it is going to be a lot tougher for it to enter the market as a new company and give the users the perception that it has a single unified approach."

Dyson told Adapso members that IBM can get away without a clear strategy in some areas of its business because it has operated in this market for a long time. But for AT&T to do so will be much harder.

AT&T, Dyson said, is very much in a "trial and error" mode, and users should not expect too many drastic moves from the company in the near future.

Commenting on AT&T's Unix operating system, Dyson said the company relinquished market control of Unix by creating it with open systems compatibility.

"Unix no longer belongs to AT&T except legally and financially. In reality, it belongs to the industry, and AT&T will need to find some other means of reaping value-added rewards," Dyson said.

IBM, she claimed, would not have an-

See AT&T page 95

M&D, ABC agree on settlement of G/L Plus issue

By John Gallant
CW Staff

NATICK, Mass. — McCormack & Dodge Corp. (M&D) and ABC Management Systems, Inc. have ended a long-standing legal dispute involving international sales of M&D's G/L Plus general ledger package.

In an agreement reached March 22, ABC Management Systems granted M&D unrestricted worldwide rights for past and future sales of the ABC Management report writer system as a subsystem within the G/L Plus package. The agreement, which was announced in a brief statement issued by the firms, also resolves all legal claims against M&D by the Bellingham, Wash.-based ABC Management.

The agreement effectively dissolves an injunction imposed last year [CW, Dec. 5] by a Superior Court judge in Whatcom County, Wash., that blocked M&D from selling the G/L Plus package outside the U.S. with the ABC Management report writer. The injunction was based on the court's finding that M&D had violated a domestic marketing agreement with ABC Management by selling an enhanced version of its report writer under the name of Financial Analysis System (Fast) to international clients as a subsystem of G/L Plus.

As a result of the joint settlement, M&D is also relieved of $2.5 million in damages awarded to ABC Management on the basis of that suit. Spokesmen from both companies declined to comment on details of the settlement, such as the specifics of the marketing agreement for the report writer software, except to say that M&D is now "free to sell the ABC product anywhere it chooses."

The settlement also casts a shadow over the recently announced agreement between M&D and Software International, Inc. (SI), which gave M&D international

See M&D page 95

CDC buys access to wafer technology

By Peter Bartelik
CW Staff

MINNEAPOLIS — Trilogy Ltd., which in recent weeks has announced problems and changes in the development of its wafer-scale semiconductor technology, has granted access to that technology to Control Data Corp. in exchange for $2 million and future royalties.

The agreement was announced last week in a joint statement issued by CDC President Robert M. Price and Trilogy Chairman Gene M. Amdahl. Unlike previous corporate licensees, CDC did not purchase an equity position in the company.

CDC is the third major U.S. computer vendor to invest in the Trilogy project. Digital Equipment Corp. and Sperry Corp. separately invested a total of $68 million for equity positions in Trilogy of 9% and 15%, respectively, and for license to use the technology. The Bull conglomerate of France, formerly CII-Honeywell Bull, also invested a smaller sum.

Trilogy's wafer-scale product purportedly will pack the capacity of 100 integrated circuits onto a 2½-in. wafer. However, Trilogy early this year announced it experienced problems with the final metalization process of the wafer, which caused the device to short out [CW, Jan. 23]. Earlier this month, Trilogy announced it had solved that problem, but had decided to simplify the design process to make it more adaptable to other vendors' products [CW, March 12].

The IBM-compatible, high-range mainframe that Trilogy plans to develop based on the wafer-scale technology was also redesigned as a dyadic, or dual-processor, configuration because the semiconductor

See WAFER page 95

NCR making good on commitment to new product lines

In 1982, NCR Corp. shareholders were told every major product line would be replaced by new generation products within 36 months, and the plan seems to be ahead of schedule.

At the low end of its information processing line, the company has brought out "professional class" personal computer products and will introduce an IBM-compatible micro later this year, according to William F. Buster, executive vice-president of the development and production group.

The Tower, a 16-bit, Unix-based multiuser system, was introduced last year, and this year the I-Tower, using RM/Cobol, was introduced to replace the I-9020. Also last year, the company introduced the 9300 with twice the power of the I-9020; several new versions of the high-end 8600 series were added. Similar developments have taken place in the retail and financial divisions.

About the only product unchanged to date is the 8500, and Buster said pointedly, "You can look at the calendar and see when we will carry that out."

Mark Bell, a researcher with Framingham, Mass.-based International Data Corp., said the Tower appears to have done relatively well in the marketplace. The products ranging from the 8200 to the 9200 had become outdated, but NCR is bringing out new products to use a major resource in software written for that outdated family, Bell said.

Wafers prepared for plasma etching at NCR's Colorado Springs facility.

Charles E. Exley Jr., NCR chief executive officer, expressed his commitment to developing mainframe technology, and Buster noted the company is committed to providing customers with the ability to migrate to all levels of processing power. But Bell and Jonathan Fram, an analyst with Paine Webber, Mitchell Hutchins, Inc., pointed out that NCR traditionally has focused on transaction processing that does not require the vast power needed for scientific processing.

"NCR traditionally has produced what were called special-purpose processors," Fram said. "Special purpose has now become the norm. They have the most realistic view of the mainframe market of any of the Bunch." Bell said NCR will provide high-range products for its customers to migrate to, but will focus on middle-range products for revenue growth.

NCR has also quietly built up its merchant semiconductor presence. Of its total semiconductor production, from three facilities, 70% is sold externally, NCR said. The firm recently signed an OEM agreement to provide Honeywell, Inc. with the NCR/32 and is working with Ford Motor Co. for special-purpose chips to be used in automobiles. Fram said the firm will announce two new mainframes, and at least one will use NCR chips.

NCR, while not at the level of Intel Corp. or Motorola, Inc., will have "important leverage" with available 32-bit chips when demand saps the supplies of the major semiconductor manufacturers, Bell said. "They are developing their own technology, and they are beginning to understand the marketplace better," he added.

NCR from page 77

ploit, some based on traditional strengths, but some completely departing from tradition.

In 1979, NCR acquired Comten, Inc., now named NCR Comten, a developer of IBM-compatible front-end processors and other communications equipment; in 1980, it acquired Applied Digital Data Systems, Inc., a supplier of VDTs; in 1981, the Office Systems Division was established to address office automation, and a microelectronics development and marketing organization was also added; and last year, NCR Telecommunications Services, Inc. was established to sell excess capacity on NCR's own switching network.

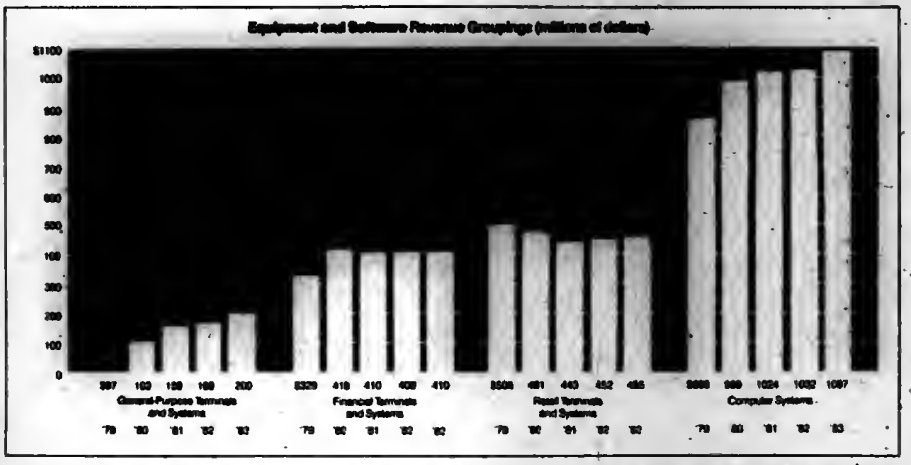
Joint ventures

The company has also established several joint ventures to develop electronics funds transfer systems from banks to point of sale and is working on similar technology for consumer self-service terminals.

Jonathan Fram, an analyst with Paine Webber, Mitchell Hutchins, Inc., observed, "They're after a large number of niches; but you've got to qualify that — they're after a large number of growing niches." Fram said of all the so-called Bunch companies, he is most optimistic about NCR's viability.

A corporate reorganization marked an infusion of the entrepreneurial spirit into an old company. "We are not attempting to orchestrate, at any level of detail from the top, what the product strategies are of these various elements," Exley said. "We have set forward areas of specialty, we have a generally agreed on technology strategy, and within that very broad compass, these units are the driving force of the business."

According to Donald J. Herman, executive vice-president over the integrated business units, "We run this company with what we call light supervision, and we're able to say to those units, 'It's your business, and you run them.'"



The NCR Tower 1632 and the 9300, both introduced last year and both designed for general applications, highlight the new way of doing things at NCR. The Tower, initially released to the OEM market, was packaged mostly from a variety of existing products from other vendors. NCR does not intend "to reinvent the wheel," according to William F. Buster, executive vice-president for the development and production units, and will purchase components and peripherals from other vendors when it seems prudent. The 9300's proprietary 32-bit very large-scale integration chip set is seen by the company as a jump forward in technology and was recently sold on an OEM basis to Honeywell, Inc. and will probably be marketed to other vendors over the coming year.

Exley

With the growth in the product line has come growth in the sales organization: NCR last year announced it would hire 500 new people for its marketing force, and executives said recently the last of the new hires are completing training.

NCR executives bitterly resent, privately at least, the adverse publicity generated by the fraud lawsuit brought against the company by The Glovertorium, Inc. and similar cases filed by NCR customers alleging misrepresentation of product capabilities. The Glovertorium won a $2.3 million court judgment on claims NCR sold it a System 8200 minicomputer and software package that allegedly never functioned at better than 20% of its warranted capability.

Manuel Garcia, who oversees all marketing operations, pointed out recently that all the lawsuits date back more than five years, "when I think people expected more than technology could give them. I think that affected every [vendor]," and involved a small percentage of customers.

But the company has taken steps to ensure that no misunderstandings occur. Sales personnel are told to make sure the customer understands what he is buying, sales managers are expected to question the salesman on what was sold, and customers receive letters from headquarters detailing the terms of the understanding, according to Garcia, so "if he received anything different from [the sales person told him], he has the opportunity to say he understood differently."

Garcia said the company places a premium on customer satisfaction, because NCR needs goodwill to survive in the information industry. "We don't have any place else to go," he said. "That [industry] is all we're in, and we don't intend to get into anything else."

The changes undertaken over the past few years seem to have gained great favor with lower level executives in production, support and training divisions around the area. One executive who was formerly employed at Wang Laboratories, Inc. recalled that when a headhunter contacted him about joining NCR, he immediately dismissed the idea of joining a declining mainframe vendor. After being convinced to meet with a senior executive, he said he got caught up in the plans under development and signed on.

NCR's reorganization encourages entrepreneurship

DAYTON, Ohio — NCR Corp. last year was reorganized to establish semiautonomous units. This, according to NCR executives, has spurred an entrepreneurial spirit within the century-old organization and will be the driving force for the company's future.

When Charles E. Exley Jr., who came to NCR after a 22-year career at Burroughs Corp., was appointed chief executive officer, the board of directors also created the office of the chief executive, with three executive vice-presidents appointed to oversee the reorganized entities.

Herman

William F. Buster, who spent 16 years with Burroughs before joining NCR in 1971, heads the Development and Production Units, composed of divisions for Data Entry Systems, General-Purpose Systems, Financial Systems, Retail Systems and Microelectronics.

Manuel Garcia, another former Burroughs man who jumped ship just before Exley, is head of the marketing units, including an Independent Marketing Organization to develop contracts with OEM firms.

Garcia

Donald J. Herman, founder of the organization that eventually became NCR Comten, Inc., was tapped as head of the Integrated Business Units, which include Comten, Applied Digital Data Systems, Inc., Office Systems, TSI, Inc., a Micrographics Division and, presumably, any future acquisitions.

Herman recalled that William S. Anderson, the outgoing chairman, and Exley visited him in Florida. Exley "wanted a marketeer, he wanted a technologist, and he wanted a businessman. He asked me to join as the businessman."

Several NCR employees told *Computerworld* that the three act as a committee, with any one of them able to make a quick decision when needed.

Buster

NCR executives readily agree the present organization produces some duplication — for example, three divisions market terminals — and divisions even compete against each other in some respects.

Exley explained the strategy: "The integrated units and the development and production units are relatively self-contained units in the sense that those divisions don't depend on anybody else for the success of what they have to offer. So the driving force from a product program standpoint is in each of those major divisions."

While NCR's own Microelectronics Division supplies its proprietary NCR/32 32-bit very large-scale integration chip set for the 9300 50-lb "mainframe" introduced last year, Exley said the other divisions will not be directed to buy NCR microelectronics if they believe other vendors have better products.

Jonathan Fram, an industry analyst with Paine Webber, Mitchell Hutchins, Inc., said the organization "is a bit of a mess," but "the company [is] realizing the degree of uncertainty in the industry."

The lack of rigidity in the organization allows the company to react to the dynamic changes in the information processing industry, he added.

NCR president airs his opinions on mainframe market dynamics

NCR

Charles E. Exley Jr., NCR Corp. president and chief executive officer, was recently interviewed by Peter Bartolik, Computerworld senior editor of Computer Industry. Excerpted below are his views of the mainframe market dynamics that have produced greater power at lower costs.

Q You have demonstrated that hardware costs for large processors are coming down, and you intend to bring them down further. Yes we do.

Q How will you generate future revenues from that area if you make the equipment so inexpensive? Is it going to be in services, software or just selling more machines?

Well, services and software, of course, are an important part of our revenue base, and software revenues are growing far more strongly than hardware revenues, but I believe these dramatic continuing price reductions will be offset by the increase in Mips [millions of instructions per second] that we ship.

Q So as you deliver more power, that will spur a demand for even more power?

That's right. That's what I believe. I also think that the mainframe market, which has been a relatively quiet market now for some years, will benefit and become much more lively a market by further substantial cost reductions.

A problem in the mainframe market is that really there isn't anything very new on the market; even the latest releases are just a circuit-enhanced version of the same old thing. So it's not surprising that there's not a lot of action in that particular market at the present time. But I think that there will continue to be very sizable opportunities in the mainframe area; it will not be as dynamic an area as small computers, because the economics for certain kinds of jobs are overwhelmingly in favor of the smaller machines.

But there are several kinds of functions that only a large mainframe can perform. For example, the two basic things are the maintenance of a big file, which for some reason somebody decided they need to maintain at a central point; and the second thing is network control — as more and more of these terminal subsystems and small computers get interconnected, the whole process of network control becomes a very important area. And it seems to be an accepted fact today in the marketplace that that's done by a host computer, a big one. So we think the mainframe market is going to continue to be a good market for as far ahead as we can see into the future, but it does need a technology breakthrough of the kind that we have not had, really, since the first integrated-circuit machines.

Now it's our hope if we succeed, as we aim to, in bringing out the first very large-scale [integration] technology machine, that we will have made that kind of step improvement in cost/performance. And, of course, there are other considerations, such as continuous service, such as the fact that there is something inherently wrong in the process of many years standing of upgrading to a higher level of performance by rolling out the old machine and rolling in the new one. There ought to be a better way of adding Mips than that, and we're going to see if we can't come up with [that] product.

Q You mean just keep the box, but switch...

Just keep adding slices of power. That is everyone's ideal. Can we find a way to do that? If we could do that, I think we'd have a real breakthrough product.

Voters want industrial policy to stress cooperation, pollsters say

By John Kirshner
CW Washington Bureau

WASHINGTON, D.C. — Election year industrial policies now being planned by the two major political parties may be rejected by voters if the policies are perceived as government intervention rather than business-government cooperation, according to two public opinion researchers.

"Americans deeply believe, at least ideologically, in free enterprise, and they are instinctively wary of the government's role in the economy," William Schneider, polling consultant to the *National Journal*, told a recent conference on future policies for basic and high-technology industries.

Kevin Phillips, president of American Political Research Corp., agreed with Schneider on the public's skepticism about the government's ability to manage the economy efficiently. But, he said, the public is frustrated about the seeming difficulty U.S. firms are having in maintaining international competitiveness. As a result, he said, "the American people are extremely protectionist."

Political geography

Phillips further suggested that public acceptance of industrial policy prescriptions will increase if the economy worsens as the year progresses. He also said the issue turns on "political geography." Government actions to bolster basic industries and promote high tech will play better in the industrial Northeast and Midwest, as well as in the textile producing areas of the South.

In general, he said, most voters favor actions to enhance research and development, increase international trade, promote management-labor cooperation and support technical education.

But, Phillips said, the public will support business-government-labor cooperation only if it is not mandated. Or, as he put it, "Cooperation yes; coercion no."

Schneider, addressing that same point, told the conference, sponsored by The Government Research Corp. and several computer and electronics industries associations, "the American public does favor ... a partnership between government and business ... to solve specific social problems on an ad hoc basis."

But, he said, "elevating government involvement in a marketplace as a system ... is clearly going too far."

Government planning strikes Americans as a very bad idea, according to Schneider. "They like the chaos. They like the ad hoc nature of government intervention as we now have it. Don't turn it into a system."

The Democrats and the Republicans will be able to sell voters on specific remedies for specific problems, he concluded, so long as the parties can persuade the public that the measures do not portend increased politicization of the economy.

Discussing various academic theories that hold the government should or can effectively develop industrial policies for allocating resources among competing U.S. business sectors, Schneider said, "I don't think the public is going to buy it."

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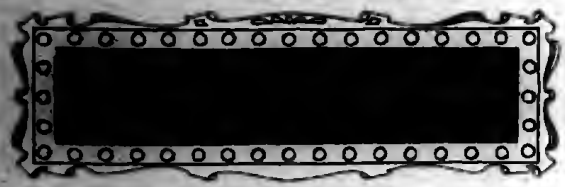

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COMPUTER INDUSTRY

Adapso to try cooperation to solve dispute with CPAs

CW AT ADAPSO

By Robert Batt
CW West Coast Bureau

DALLAS — The Association of Data Processing Service Organizations, Inc. (Adapso) is negotiating with some of its rivals from the Big Eight accounting firms in an attempt to end a long-standing dispute.

Adapso said it is now trying the tack of cooperation rather than confrontation after failing in a recent attempt (CW, Dec. 5) to persuade the Securities and Exchange Commission (SEC) to rule on the propriety of certified public accounting (CPA) firms selling DP services to companies that they also audit.

In an interview at Adapso's 60th Management Conference here recently, Douglas Jerger, chairman of Adapso's CPA Relations Committee, said the organization has held a series of meetings with representatives from Arthur Andersen & Co., Coopers & Lybrand and Peat, Marwick, Mitchell & Co. to resolve the controversy over DP services. "Talks about talks" are going on with some of the other firms, Jerger added.

Providing DP services comprises the bulk of revenues for many of Adapso's 575 members, and in the past, some have threatened court action against individual Big Eight firms.

For several years, Adapso has carried on a crusade against the CPA firms, charging that an independent auditor cannot be truly independent, as is required by law, if the data processing systems used to prepare a client's financial statements are developed by that same auditing company.

Jerger characterized the change of direction as a victory of sorts for Adapso. "It was always the intention of the CPA Relations Committee to establish a dialogue with the accounting firms. We now have that dialogue, and we hope the relationship will blossom and that we can coexist in a way that is beneficial to all of us," he said.

Jerger said there are benefits to cooperation between the two sides that were not perceived 18 months ago, and this has slowed the pace of possible litigation.

"This is not a simple, clear-cut issue. It is one that is difficult to handle in a way that is fair and straightforward, and as we talk, the positions of the respective parties are changing as they come to appreciate the other guy's point of view," he added.

Jerger, however, denied that Adapso has totally abandoned its attempts to outlaw CPA firms from the DP services arena. Rather, he said, such action was on hold, and Adapso is retaining the option to challenge the recent SEC ruling in the courts.

At the same time, he continued, Adapso is setting up a research project to survey companies and interview financial and management information systems executives in an attempt to gather data about the participation of CPA firms in DP services.

The object of the project is to discover the impact of "management advisory services" within the major auditing firms, he said. "We want to base our decisions on real information and bring this episode to its conclusion," he added.

Co-founder leaves Vector Graphic

THOUSAND OAKS, Calif. — Vector Graphic, Inc. announced recently that Lore Harp, co-founder of the company, has resigned as president and chief executive officer and as a director of the company.

Bernard Horn, 46, formerly sales and marketing vice-president of the Xerox Corp. Printing Systems Division, has been appointed to the position of president and chief executive officer, according to a company spokesman.

Vector Graphic enjoyed early success in the microcomputer market, but has seen its financial situation deteriorate as the IBM Personal Computer soared to the top of the marketplace.

Jean Deleage, chairman of the board of the company, said in a statement at the time of the announcement, "We realize the difficulties of being a strong, long-term contender in the microcomputer industry, but we are extremely pleased to have made some major steps in the past four months."

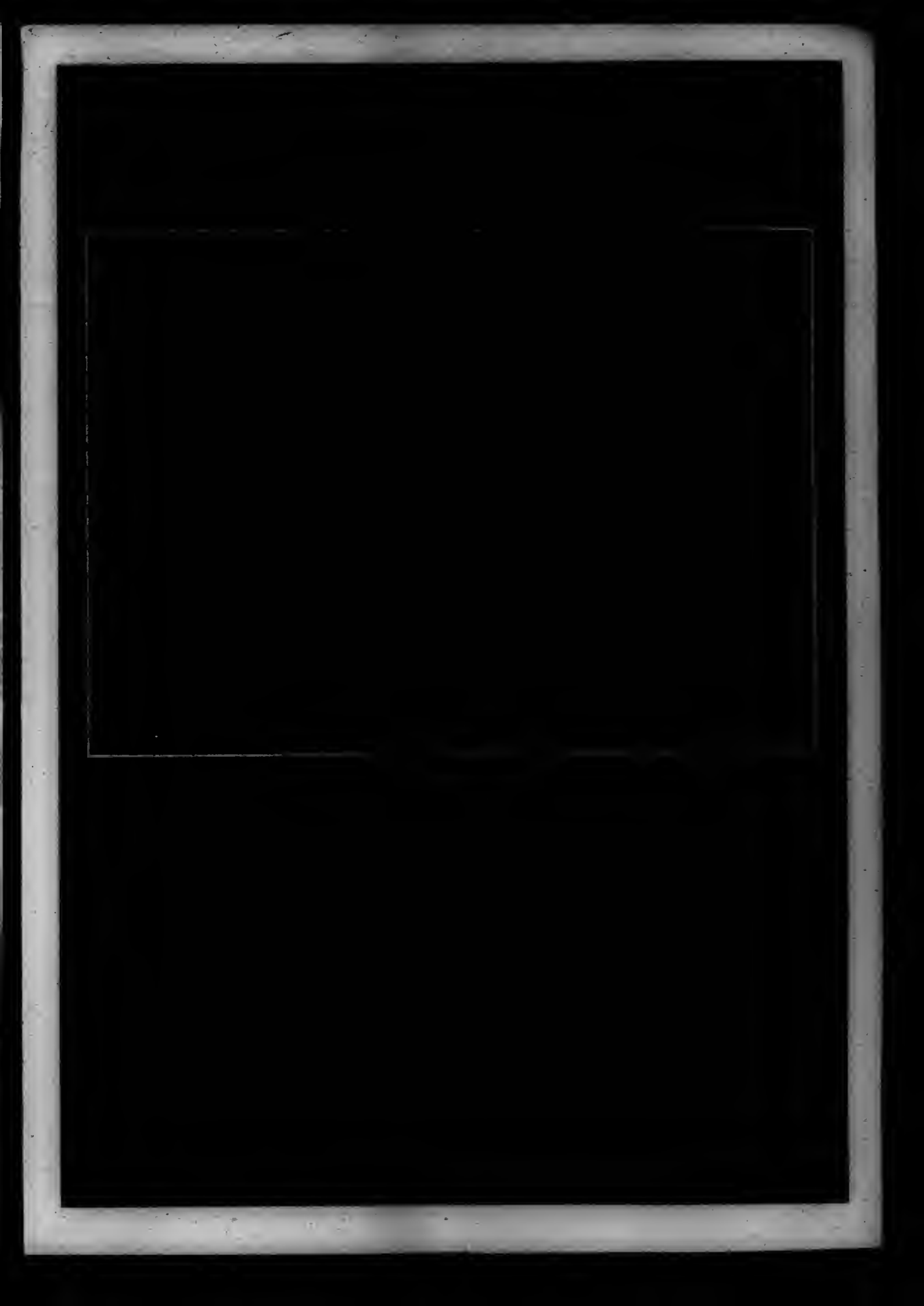
Vector Graphic recently announced a new desktop computer that claims to be two to 10 times faster than IBM's Personal Computer and in recent months obtained financing totaling $4.7 million.

Delays limit Rolm revenue growth

SANTA CLARA, Calif. — Rolm Corp. recently announced it expects revenues for the third quarter will be only slightly above the second quarter, due to delays in installations.

M. Kenneth Oshman, president, said the "delays are due to some construction slippages at customer sites; difficulties in obtaining central office facilities and some product shipment delays."

The company posted revenues of $166 million during the second quarter, and stock analysts had predicted third-quarter revenues ranging from $175 million to $180 million.



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Because Videodata LAN/1 is a broadband system, dedicated channels can be used for full-motion video applications such as CAD/CAM and teleconferencing. These video signals are kept entirely separate from digital traffic on the network's token-passing channels.

So far, so good. But most token-passing networks are baseband systems, meaning that terminals must share a common channel as they would in a typical contention network. This can limit speed and capacity in some applications.

LAN/1 overcomes this possible limitation by combining token-passing with a proven *broadband* technology that allows many channels to be put on a single cable. The payoff: higher channel speeds, ranging up to 2.5 MB/s over a maximum seven-mile radius, with terminal data rates of up to 19.2 KB/s. Plus a capacity of up to 10,000 devices to allow plenty of room for future expansion.

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COMPUTER INDUSTRY

Links seen as tip of iceberg
In untapped mart for productivity tools

CW AT ADAPSO

By Robert Batt
CW West Coast Bureau

DALLAS — The micro-to-mainframe link represents just the tip of the iceberg in a largely untapped market for productivity tools, according to John Landry, senior vice-president for McCormack & Dodge Corp.

Speaking at the 60th Management Conference of the Association of Data Processing Service Organizations, Inc. recently, Landry said the current frenzy over micro-mainframe links is obscuring a sense of personal computer productivity and application software waiting to surface in the Fortune 2000 marketplace.

Landry told a conference session that a great many link vendors will emerge over the next few years, but link software distribution will be dominated by the current front-running mainframe software suppliers.

The total software company of 1986, he said, will have the following characteristics:

- Mainframe applications in areas such as financial services, human resources and manufacturing.
- Mainframe development tools.
- Micro-mainframe links.
- Personal computer productivity tools and micro applications.

Selling "total solutions" will require personal computer application software integration with front-running mainframe applications packages.

These front-end extensions, he said, will include data entry and editing facilities, functionally compatible front ends, concurrent processing and fully functional micro applications interfaced to mainframe applications.

"Links could become the loss leaders used to capture customers into a mainframe and micro proprietary software architecture," he suggested.

Also speaking at the session, Jeffrey Walker, chairman of Walker Interactive Products, Inc., a San Francisco-based software company, claimed micro-mainframe links are very immature when it comes to addressing the needs of the marketplace.

The links, he contended, contain artificial restrictions, are often based on IBM 3270 technology with its inherent limitations and do not address the total problem from the end user's point of view.

"The problem for micro-mainframe links is in trying to handle a wide variety of different software that is available to end users who often choose their packages on the basis of personal bias rather than corporate standards," he said.

The real problem in micro-mainframe links, Walker added, is a human engineering problem rather than a technology problem.

"The software that runs on the mainframe should be able to run on micros. Personal computing is the goal because it is what the end user wants. Personal computing should therefore be available, no matter what the hardware," he argued.

Vaughan Merlyn, president of Merlyn Corp., commented on the shift in power away from the data processing department and toward end users that micro-mainframe links afford.

"Micros are growing up to become mainframes, and the distinction between the two is blurring. As a result, the decision-making power is shifting from the DP department to the end user, and many mainframe vendors are not at all equipped to deal with this change," he said.

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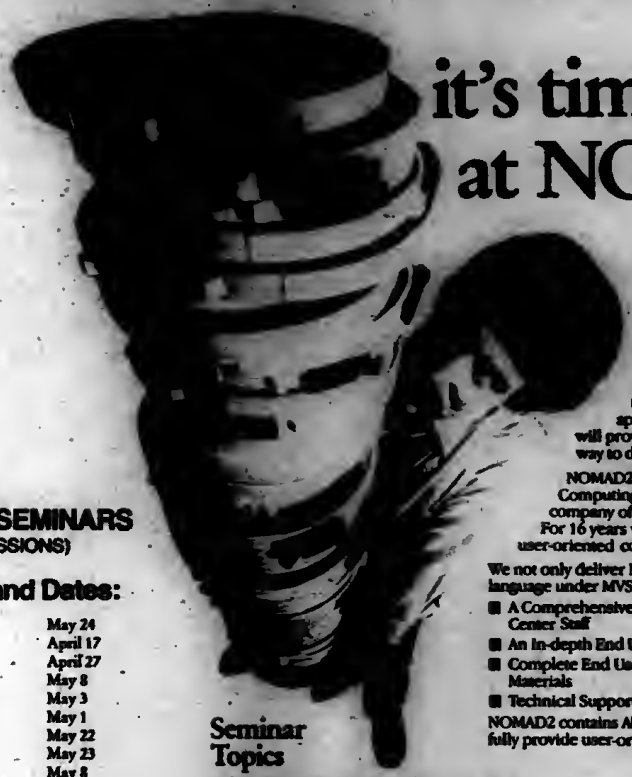

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Exec urges financial services to meet human needs

CW AT ADAPSO

By Robert Batt
CW West Coast Bureau

DALLAS — "The financial services landscape is littered with innovations that consumers do not want. In this business, you do not necessarily get a gold star for being out in front with a leading-edge technology."

That was the message delivered here recently by Garland Cupp, executive vice-president of the American Express Travel Related Services Co., Inc., to some 500 computer services executives attending the Association of Data Processing Service Organizations, Inc.'s (Adapso) 60th Management Conference.

In a keynote address on "The Role of Technology in the Financial Services Industry," Cupp said it is the customers, not the technologists, who will determine the future use of computer systems by financial institutions.

Cupp sees three issues as key to adapting computer-related technology to the financial services industry successfully — hardware, software and the human dimension. The last is by far the toughest, he said.

Customers will decide

"Customers will decide the technology they want. They will make the trade-offs between efficiency and privacy, cost and convenience. This makes it very difficult for vendors to lay out strategic and tactical goals," he said.

According to Cupp, two possibilities are open to the financial services high-tech supplier:

- A supermarket approach, in which the supplier appears as all things to all people.
- A boutique approach, in which the service supplier aims at specific market niches.

Making the choice, he added, is risky: "The dilemma is how to manage these enormous sets of uncertainties. You must do something, since a 'do nothing' stand will certainly fail. Timing is everything."

Cupp said it is important to be well prepared in both hardware and software, where the technology already exists to do the job that customers want.

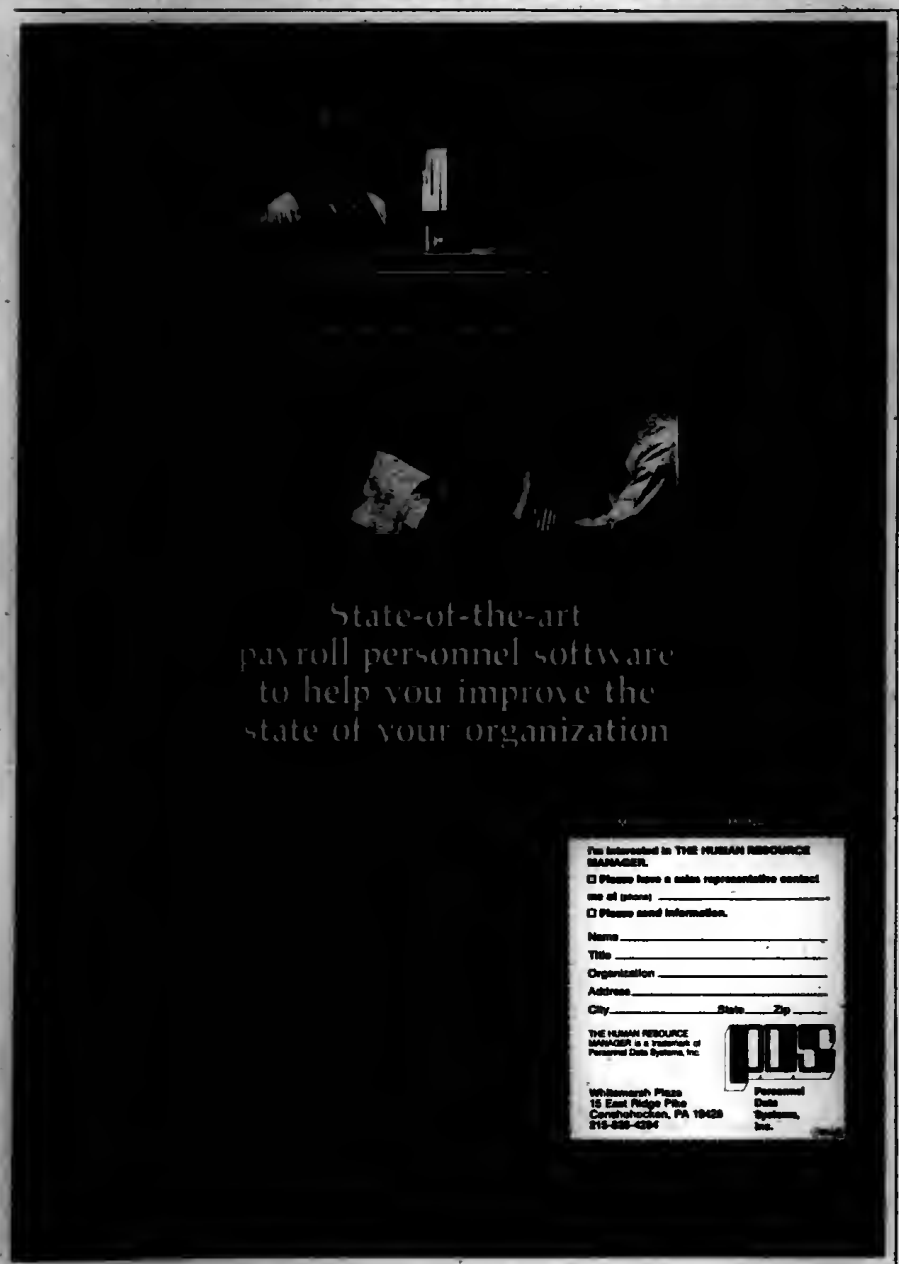
Flexible strategy

A flexible strategy is vital for a high-tech supplier to move in whatever way the human dimension element takes it, he declared. "Technology has given us unprecedented options. We are currently in a period of experimentation which reflects the confusions and dilemmas of our technological age. The key to the success of financial services companies is how well they understand the human dimension."

Cupp reminded his audience that the human dimension of applying technology to the financial sector must also take government actions into account.

The financial services industry, he complained, is operating under antiquated laws that were drawn up 50 years ago and are not meant for a high-technology world.

"These laws must be reformed if we are to remove artificial restrictions. Rules that stand in the way of innovation must be modified," he concluded.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Prelude, Lotus agree to AI licensing pact

CAMBRIDGE, Mass. — Lotus Development Corp. has announced a licensing agreement with Prelude Development Corp., a start-up artificial intelligence software firm.

Under the agreement, Prelude, which was founded by a former Lotus employee, will license AI software technology to Lotus, which plans to market products incorporating the technology within 18 to 24 months.

"This agreement permits Lotus to stay abreast of and involved with the latest developments in productivity technology without sacrificing its own short- and medium-term research focus," said Lotus President Mitchell Kapor.

Prelude President and founder Peter Gabel, who recently resigned from his position as manager of the Advanced Development Group at Lotus, added that development work will move ahead faster and further with Prelude operating as an independent entity.

Gabel is joined by another Lotus Advanced Development Group employee, Paul Weiss, now vice-president of research and development at Prelude.

The start-up reportedly will develop a family of productivity products based on intelligent data bases to be introduced in the spring of 1985.

Accountant: Software R&D costs should be capitalized

Speaking to attendees of Adapso's 60th Management Conference

DALLAS — Software development cost accounting should be changed to allow developers to capitalize those costs and show them as assets, a senior partner in a Big Eight accounting firm told the Association of Data Processing Service Organizations, Inc. (Adapso) recently.

Speaking at Adapso's 60th Management Conference, Francis J. O'Brien of Arthur Young and Co. said present accounting practices for software development "will make the going increasingly rough for the software industry."

Under a 1974 ruling by the Financial Accounting Standards Board (Fasb), software companies are forced to treat costs as current research and development expenses rather than capitalizing them and showing them as assets on balance sheets, O'Brien said.

"As a result, [software companies] will encounter more and more difficulty in borrowing the funds they need for future products because they cannot put their assets on their balance sheet," he said.

O'Brien said the building of software development involves using a known technology to achieve a known end, while traditionally defined R&D involves many uncertainties.

Some software companies, according to O'Brien, have circumvented the problem by acquiring software development from others.

These moves may "be unduly expensive and thus ill-advised in that the only reason they are made is to allow the purchaser to show the product as an asset and avoid the current charge to earnings," according to O'Brien.

O'Brien urged the Fasb to solve the problem by approving a recently submitted recommendation from a joint task force of the American Institute of Certified Public Accountants and Adapso.

National Semi registers third-quarter profit of $15.4 million

SANTA CLARA, Calif. — National Semiconductor Corp. recently announced a third-quarter profit of $15.4 million, compared to a loss of $18.5 million during the corresponding period one year ago, as sales climbed $121.1 million over the same period.

For the first three quarters of fiscal year 1983, National Semiconductor posted sales revenues of $1.2 billion compared to $690.6 million last year, producing a profit of $30.5 million, or 47 cents per share, compared to a net loss of $31.9 million in the first three quarters of fiscal year 1982.

Charles E. Sporck, National Semi president and chief executive officer, said the improvement of more than $54.8 million in pretax profits compared to the third quarter a year ago and the $90.2 million improvement on a year-to-date basis were due primarily to sharply improved operating performances in the components segment.

Pretax charge

Also, results for the third quarter of fiscal 1983 included a $9 million pretax charge related to the closing of the medium systems computer manufacturing facility in San Diego, the vendor said.

"Overall, we've established a quarterly record for order rates," Sporck maintained, adding that the key to this achievement was the Semiconductor Division's 68% increase in order rates from the same period a year ago.

Effective at the start of the quarter, National changed its depreciation method for newly acquired machinery and equipment from the double-declining balance method to the 150% declining balance method. However, the change did not have a material impact on third-quarter or year-to-date earnings or earnings per share, according to a spokesman for the company.

Just after the close of the quarter, National Semi and the federal government reached agreement to dispose of liabilities arising from a grand jury probe into National's testing and certification of military microcircuits supplied between 1978 and mid-1981.

The company agreed to pay the government $1.76 million. According to Sporck, provision was made in fiscal year 1983 for this matter. As a result, the settlement did not have a material effect on the company's financial results for the quarter.

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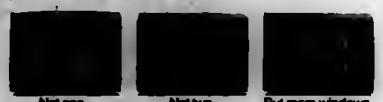

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Computervision held liable in PE patent suit

Has attached qualification to its financial statements pending suit's outcome

BEDFORD, Mass. — Computervision Corp. has attached a "qualification" to its 1981, 1982 and 1983 financial statements pending the outcome of a $40 million patent infringement suit brought by Perkin-Elmer Corp.

"The qualification doesn't really pertain to the case or to the amount, and as soon as the case is settled or adjudicated in some manner, that qualification will be removed," said Computervision spokesman F. James Carr.

PE brought the suit against Computervision before a San Francisco federal court in 1977. U.S. District Judge William H. Orrick is expected to rule soon on PE's request for $40 million in damages and interest. Orrick recently concluded a hearing on damages after the 9th U.S. Circuit Court of Appeals reversed a jury verdict that was in Computervision's favor.

Liable for damages

That reversal left Computervision liable for damages relating to its former Cobilt Division's infringement on PE's patents for the Micralign projection mask aligner, a product designed to align masks with wafers and the design patterns embedded on them.

Computervision, which is appealing the circuit court decision, and its auditors, Price Waterhouse & Co., issued the qualification March 23, 1984, and emphasized that the litigation has no impact on its current operations.

For the year ending December 31, 1983, Computervision reported $35.3 million in earnings on revenues of $400 million.

At the same time, Computervision complained that it was surprised that PE asked for $40 million in damages and said that the companies had discussed a much lower settlement. "We were thinking more in a range like 10% of that," Carr said.

PE unaware of negotiations

A PE spokesman responded that company officials were "aware of no such negotiations."

Computervision sold its Cobilt Division to Applied Materials, Inc. in 1981.

Until enjoined by the court, Cobilt produced a CA 3000 semiconductor projection alignment system designed to compete with the Micralign.

Eagle expects revenues loss

LOS GATOS, Calif. — Eagle Computer, Inc. said recently it expects losses ranging from $7 million to $9 million for the quarter ended March 31, partly due to a recent settlement whereby the company agreed to drop a microcomputer Basic I/O System (Bios) alleged to be an infringement on an IBM copyright.

Eagle said it expects sharply reduced revenues for the quarter will result from delays in converting to a new Bios and from write-downs to be taken on certain assets.

In accordance with the terms of the IBM settlement, Eagle ceased shipping micros with the contested Bios on March 6 and began shipments of the new Bios on March 23.

The suit was filed and settled the same day in February when IBM charged Eagle had copied substantial portions of IBM's Bios that is used in the IBM Personal Computer.

Eagle said it experienced an unexpected drop in orders as a result of the conversion. The company also said it was forced to delay announcement of a new microcomputer product that had been expected to contribute to third-quarter revenues.

Software AG airs profits rise

RESTON, Va. — Software AG Systems, Inc. recently reported third-quarter profits of $1.6 million, or 27 cents per share, compared with a loss of $253,000, or four cents per share, in the third quarter of 1983.

Revenue for the third quarter ended Feb. 29 was $10.5 million, compared with $7.6 million in the corresponding period a year earlier.

The third-quarter loss in 1983 reflected a $810,000 deficit resulting from a $1.5 million settlement of litigation with Mini-Technology, Inc.

For the nine-month period just ended, the company reported revenue of $29 million and profits of $4 million, or 66 cents per share, compared with revenue of $21.1 million and profits of $266,000, or four cents per share, during the comparable period in fiscal year 1983.

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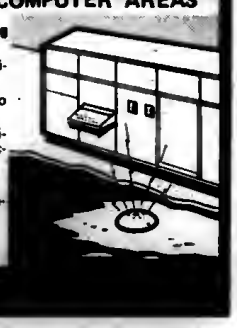

Dorlen Products

COMPUTER INDUSTRY

Victor OKs European offer to buy its micro business

SCOTTS VALLEY, Calif. — Victor Technologies, Inc.'s board of directors has approved an offer from its European distributor, Applied Computer Techniques PLC (ACT), to purchase Victor's microcomputer business [CW, March 26].

Although the financially troubled micro maker's debt is estimated at $100 million, it said the purchase price "will amount to substantially less" than its $75 million in unsecured debt. Efforts to reach representatives of ACT and Victor's creditor committee for comment were unsuccessful. The terms of the agreement were not disclosed.

Under the proposal offered by the Birmingham, England-based distributor, Victor said it will retain distribution rights for North America and South America for Victor microcomputer products to be made by ACT.

Victor's recent filing for protection from its creditors under Chapter 11 of the Federal Bankruptcy Act made it the third micro maker in a six-month period to do so. Acceptance of ACT's bid is "subject to a definitive agreement and the approval of a bankruptcy court," a spokeswoman for Victor said.

Revenues up at Ashton-Tate

CULVER CITY, Calif. — Ashton-Tate, Inc., the microcomputer software and book publisher located here, recently announced that annual profits and revenues both were up more than 200% over restated figures for fiscal year 1982.

For the year ended Jan. 31, Ashton-Tate reported revenues of $39.8 million, up 297% from the $10 million experienced in 1982.

Profits for 1983 were $6.2 million, or 78 cents per share, for the publisher, up 266% from the $1.7 million, or 23 cents per share, experienced in 1982.

Figures for 1982 and the first six calendar months of 1983 were restated to reflect divestiture of two divisions and the acquisition of product rights.

In the fourth quarter of fiscal year 1983, the company had revenues of $13.5 million and profits of $1.7 million, or 20 cents per share.

Commenting on the success of Ashton-Tate, David Cole, president and chief executive officer, said the microcomputer data base software vendor expects "record sales and earnings for this year, largely through the introduction of new, but related, products."

Cancer Institute seeks vendors

BETHESDA, Md. — The National Cancer Institute (NCI) is seeking computer utility vendors to provide information on cancer treatment to community-based physicians with office or personal computer systems through its PDQ data base systems.

Currently available only through National Library of Medicine Medlars centers, PDQ provides health professionals nationwide with information about the prognosis and accepted treatment options for specific cancers and treatment protocols.

Additional information can be obtained through NCI PDQ, Room 11A49, Building 31, National Institutes of Health, Bethesda, Md. 20205.

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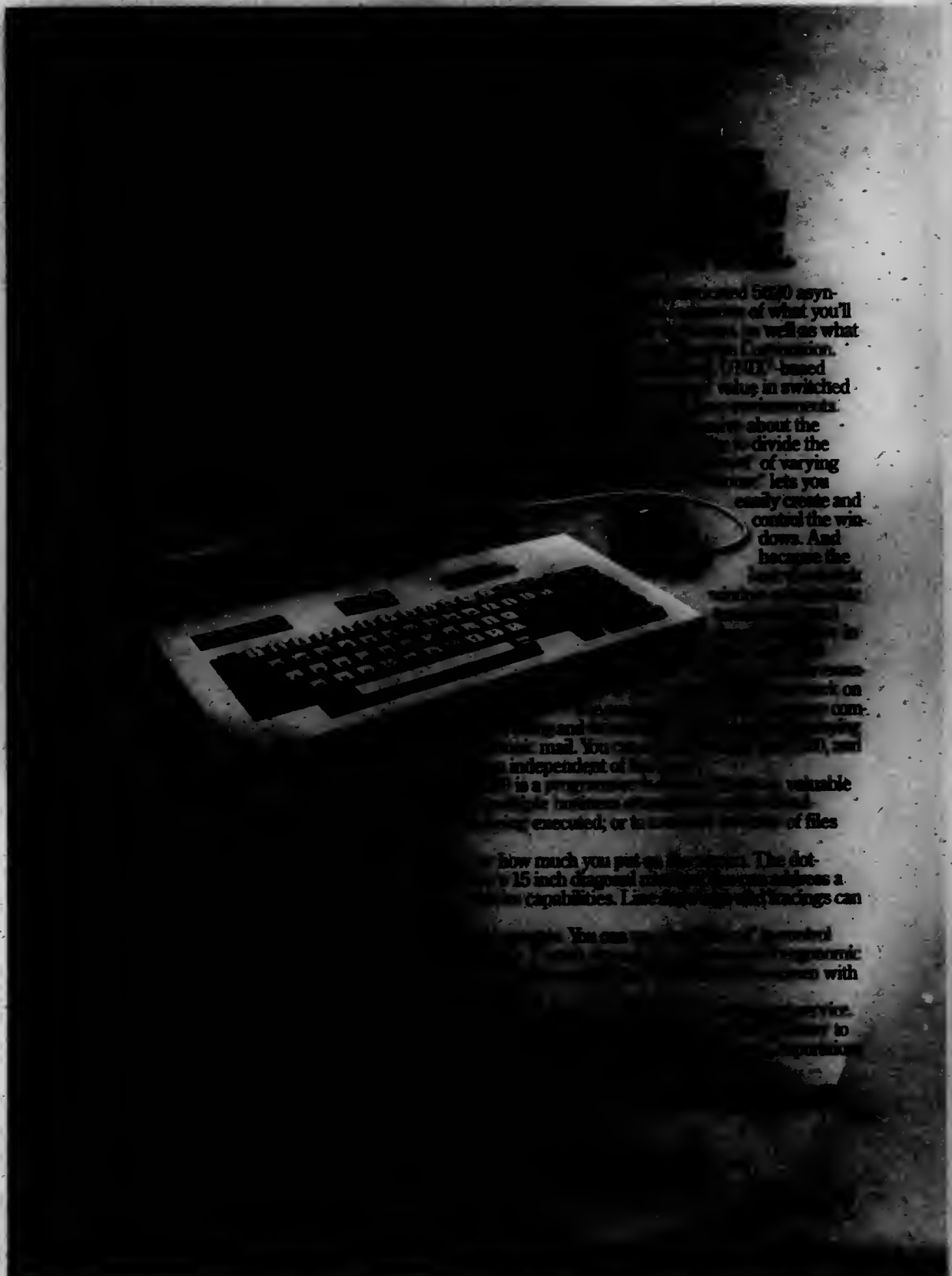

COMPUTER INDUSTRY

MODELS AND MERGERS

Computer Task Group, Inc. has reported revenues of $64.1 million and earnings of $1.4 million for the year ended December 1983. Earnings per share for 1983 were 75 cents, compared with 62 cents from 1982.

■

Televideo Systems, Inc. has reported an increase in sales of 11% for the first fiscal quarter of 1984. Sales totaled $43.2 million, up from $38.9 million last year. Net income gained 17% to $5.7 million from $4.9 million for the period.

■

Monitor Systems Corp. reported a net loss of $3.6 million for the fourth quarter, compared with net income in the corresponding period a year earlier of $619,000, or 8 cents per share. Sales rose to $6.1 million from $5.8 million in 1982. For 1983, a net loss of $8.7 million was reported, compared with 1982 net income of $1.5 million. Sales were $30.1 million, up from $19.2 million in 1982.

■

Computer Synergy, Inc. has filed a registration statement with the Securities and Exchange Commission covering the public offering of 645,000 shares of common stock. The company will issue and offer for public sale 575,000 shares, and 70,000 shares will be sold by existing shareholders. The public offering will take place in mid-April.

■

LTX Corp. announced results for the second quarter ending Jan. 31. Sales were $19.3 million, compared with $12.8 million for the corresponding period a year earlier. Net income was $1.2 million, or 16 cents per share. Sales for the first six months ended Jan. 31 were $34.4 million, an increase of 50% over sales of $22.9 million in the prior year; six-month earnings were $2.1 million, or 28 cents per share, compared with $930,000, or 14 cents per share, for the earlier period.

■

Amistar Corp. has filed a registration statement with the Securities and Exchange Commission for public offering of 1.3 million shares of common stock. The offering is to be made in April by an underwriting group managed by L.F. Rothschild, Unterberg, Towbin.

■

Science Management Corp. announced sales for 1983 of $68.9 million and a net loss of $1.1 million, or 49 cents per share. In the fourth quarter, sales increased to $21.9 million with a net loss of $519,000, or 20 cents per share.

■

Wyle Laboratories reported sales increased 61% for the fourth quarter to $84.7 million from $52.7 million in 1982. Net income for the quarter was $2.5 million, or 34 cents per share, compared with a net loss of $369,000 in 1982's fourth quarter. Sales for fiscal year 1983 were $293.6 million, up 41% from 1982. Preliminary net income for the year was $7.1 million, or $1.05 per share, compared with 1982's net loss of $3.1 million.

SUPERMICROS

BSSC Industries has joined the Microelectronics and Computer Technology Corp. (MCC) joint research venture. MCC was launched in 1983 to conduct long-range, advanced research.

■

Harris Corp.'s Government Systems Sector has announced completion of a

Continued on page 97

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M&D from page 77

marketing rights to SI's The System report writer software [CW, Feb. 20]. Software International's report writer is similar to the Fast system, and the joint marketing arrangement was clearly intended to allow M&D to circumvent the injunction against international sales of G/L Plus with a Fast-like subsystem.

In an interview with Computerworld, ABC Management President Vernon W. Ruskin said he was "pleased the two firms could reach an amicable settlement of the dispute."

M&D Chairman James M. McCormack said in prepared remarks that the agreement is "in the best interests of our international customers, agents, employees and prospects" and that it "places no restrictions on [M&D's] ability to market and support G/L Plus domestically or internationally."

The statements were in sharp contrast to remarks made earlier by McCormack, who said M&D pursued the SI deal when it "became clear after extensive negotiations that there was no interest from ABC Management in a reasonable settlement" of the dispute. At the time, Ruskin countered by saying that M&D was not "negotiating seriously" in the matter.

WAFER from page 77

design changes made the originally planned uniprocessor too slow. The mainframe's first shipments were rescheduled for mid-1986.

A CDC spokesman declined to reveal if the Trilogy changes had any impact on CDC's decision to license the semiconductor technology.

The spokesman also declined any comment on when CDC hopes to use Trilogy's technology in CDC products.

In prepared statements, CDC's Price said that "Trilogy's pace-setting development of wafer-scale integration clearly has the promise of providing even higher standards of performance and reliability to [CDC's] top-end processors.

"In addition, the manufacturing cost projections for systems using this technology gives us confidence that [CDC] will continue to be the cost-performance leader in high-end scientific processors well into the '90s," he said.

Trilogy's Amdahl said CDC's purchase of rights to the wafer-scale technology "provides continuing evidence of its applicability across a wide range of applications beyond [Trilogy's] use in our present large-scale IBM-compatible developments."

AT&T from page 77

nounced a port for Unix if it genuinely believed that the operating system still belonged to its rival, AT&T.

On a related topic, Dyson claimed the data communications market will remain confused for some time because of the unpredictable behavior of the recently divested Bell operating companies.

"These [former Bell operating companies] promise a lot, but they don't necessarily deliver. From the point of view of Adapso members, to have someone flailing around in the marketplace can be more dangerous than a well-mannered competitor that knows what it is doing," she said.

Dyson said the important question for computer services companies is whether the former Bell operating companies will buy software or hire away people.

"Initially, they will buy your software, but the [former Bell operating companies] do not have the people they require to compete effectively, and in the long run, they will try to lure your people away."

Also speaking at the session, Jack Baxter, executive director of planning for AT&T Technologies, agreed that the firm has yet to adopt a clear-cut strategy in data communications. He added that the market is still emerging and, so, AT&T is at no great competitive disadvantage. He outlined four distribution channels through which AT&T Technologies intends to bring solutions to its customers: internal and end-user sales forces, independent software vendors, value-added resellers and retail distributors.

The AT&T executive stressed that no one vendor can develop solutions to meet all the problems of its business customers.

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COMPUTER INDUSTRY

Continued from page 94

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Uniden Corp. of America has announced its entry into satellite television and communications and has appointed Guy C. Davis to head the company's new Satellite Technology Group for the U.S. and Canada.

■

Stratus Computer, Inc. announced it has received a contract from **Lockheed Electronics Co.** for a network of fault-tolerant computers. Lockheed was recently selected to modernize and automate the Republic of China's air traffic control system. The Lockheed system will include a distributed network of a dozen Stratus/32 Continuous Processing Systems.

■

John A. Venator has been named executive director of the Data Processing Management Association.

■

Visa International has authorized France's Carte Bleue to issue a Visa card containing a computer chip in the card's top blue band. The board's approval will permit Carte Bleue to use Visa cards as part of a 10,000-card pilot test of the memory card — often referred to as the "smart card."

■

Microelectronics Business International (MBI) has completed funding to establish **Advanced Semiconductor Engineering** of Taiwan. The financing to fund the $18 million project was arranged through Citibank of Taiwan. MBI also negotiated the purchase of an existing 100,000-sq ft manufacturing facility in the Nantze Export Processing Zone.

MERGERS AND ACQUISITIONS

SPE Technologies, San Fernando, Calif., has announced that it has acquired **Orchard Electronics, Inc.**, which is headquartered in Concord, N.C. According to SPE, Orchard was acquired for cash and will be operated as a wholly owned subsidiary of SPE.

■

Teradyne, Inc., Boston, announced recently its acquisition of the Burlington Division of **Scientific Atlanta, Inc.**, Burlington, Mass. The division now becomes part of Teradyne's component test group, which is under the direction of Vice-President James Prestridge.

■

Informare Corp., Nashville, announced it has become a subsidiary of **Innovision, Union Planters Corp.**, Memphis. Terms of the merger were not available.

■

Information General Corp., Woodland Hills, Calif., and **Cyma Corp.** announced that both companies have terminated talks concerning possible acquisition. According to Informatics' President Bruce T. Coleman, the companies could not reach agreement on terms of the proposed acquisition.

■

Spectravideo, Inc., New York, has reached an agreement with **Bondwell Holding Ltd.**, Hong Kong, subject to satisfactory arrangements with its creditors, for Bondwell to acquire the controlling interest in Spectravideo. A condition of the agreement, it was announced, is the restructuring of approximately $2.6 million of Spectravideo debt.

■

Kaufman Data Communications, Inc., Mountain View, Calif., is the new name for Kaufman Research Manufacturing., Inc., which has been acquired by Orange Nassau Electronics, Inc., Tempe, Ariz. Terms of the acquisition were not available.

■

Ultimate Computer Services, Denville, N.J., and **ADL Enterprises** announced a merger of the two firms. The combined company will be known as Ultimate Computer Services. Terms of the merger were not available.

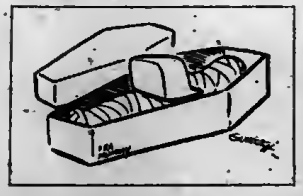
AT&T joins Cbema group

WASHINGTON, D.C. — The executive committee of the Computer and Business Equipment Manufacturers Association (Cbema) recently approved a membership application submitted by AT&T.

"AT&T is the first major telecommunications provider to join Cbema," said Vico Henriques, Cbema president. "Their membership reflects the merging of interests between the major components of the industry and will allow the industry to speak with a more unified voice on domestic and international issues."

Cbema is an association composed of 40 companies that manufacture and sell computer and business equipment hardware, software, telecommunications, services and supplies.

Henriques said he expects AT&T representatives to the association to offer new insights and perspectives on Cbema's major issues.



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Closes May 4.

JULY.

AT&T update.
Who are the winners and who are the losers after more than six months of deregulation?
Closes June 1.

AUGUST.

This issue will look at various teleconferencing technologies—including full motion video, freeze frame, electronic blackboards and computer conferencing. The cost-effectiveness of teleconferencing technology will be examined, plus information on private and public facilities—all in the August issue.
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POSITION ANNOUNCEMENTS

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Twelve month, exempt position, $24,000 - $28,000 annual salary, good fringe benefits. Additional compensation for part-time teaching.

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Faculty member will teach courses in the Associate in Science in Computer Science degree program, including introductory courses, programming courses, and systems analysis and design. Responsibilities include student advisement, and curriculum revision to insure continued successful student placement.

Masters degree preferred, Bachelors degree required. Significant teaching experience and experience in business data processing environment required.

Continuing appointment position, Assistant Professor rank, $18,000 range. Additional compensation for evening and summer school instruction.

FACULTY POSITION IN DATA PROCESSING

Faculty member will teach courses in the Associate in Applied Science in Data Processing degree programs, including introductory courses, programming courses, and systems analysis and design. Responsibilities include student advisement, and curriculum revision to insure continued successful student placement.

Masters degree preferred, Bachelors degree required. Significant teaching experience and experience in business data processing environment required.

Continuing appointment position, Assistant Professor rank, $18,000 range. Additional compensation for evening and summer school instruction.

Send letter of application, resume, and three letters of reference by April 27, 1984 to: Personnel Office, Community College of the Finger Lakes, Canandaigua, New York 14424. EEO/AA.

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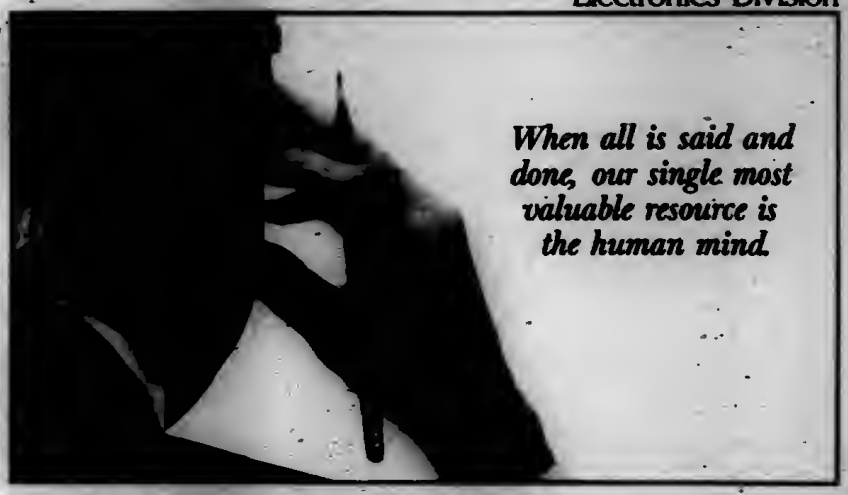

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Computer Assisted Recruitment International, Inc.

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TECHNICAL SPECIALISTS
Data base, data communications, telecommunications, minis, micros, systems software and application software technical skills required. Degree in Computer Science or Engineering and good interpersonal skills necessary.

AUDIT/SEC SOFTWARE SPECIALISTS
Will develop, design and implement micro computer software. Bachelor's degree in Computer Science and/or Accounting (15-20 hours in each) and high SAT's/ACT's required.

PROJECT MANAGERS
Provide project management support and consultation in the inception, development, design and implementation of major projects and management systems. Qualifications include 5 years experience in systems analysis, good communication and business and technical problem solving skills. Bachelor's degree required. Master's preferred.

SENIOR PROGRAMMER/SENIOR PROGRAMMER ANALYSTS
Provide support for the development of major new CICS applications. Candidates must have 3 years experience in COBOL and CICS programming in a large IBM mainframe environment.

SYSTEMS ANALYSTS
Work with multiple users in an on-line environment. Responsibilities include installation, new release and testing of INQUIRE systems on 3081 and 3033 hardware. Three years experience with COBOL, PL1, and TSO/INQUIRE, CICS/INQUIRE and 2 years user friendly language experience essential.

SENIOR TECHNICAL ANALYSTS
Support user telecommunication projects and interface personal computers with word processors. Responsibilities include hardware and software selection, development of PC communication architecture, training, debugging and vendor interfaces. Candidates will have a technical degree and minimum 4-6 years related experience.

SENIOR SYSTEMS ANALYSTS
Assume an expanding role in a corporate MIS operation. Candidates will have 5-8 years related systems experience to include 3 years COBOL, IDMS and 2 years with user friendly languages.

TECHNICAL SPECIALIST
Initiate and support a variety of program products in an MVS/JES3 environment. Heavy involvement with top secret security package. Strong BAL programming and design skills, previous installation and support experience required. B.S. in Computer Science or equivalent experience.

PROGRAMMER/ANALYST
Must have 2-4 years experience COBOL, SPF, TSO, HIPO, OS/JCL. Will write programs specifications and code programs.

TECHNICAL PROGRAMMER
Support Network Control, activate and monitor on-line performance, circuit and equipment operation and supervise operators on a large network. Prefer 2 years experience operating a large network, knowledge of VTAM, CICS, 3705's, NCGE, NPDA and problem diagnosis/resolution. TSO and JCL a plus.

SENIOR SYSTEMS PROGRAMMERS TELEPROCESSING SYSTEMS
Working with IBM 3081 hardware and an MVS system with an SNA network, positions provide systems programming support for telecommunications software and test processing products. Bachelor's degree in Computer Science or equivalent, and 2 years software experience utilizing CICS or VTAM in an IBM environment required.

SOFTWARE RECOVERY COORDINATOR
Prepare, test and maintain documentation and procedures to assure recoverability of critical software resources. Provide technical leadership for IPC Disaster Recovery Coordinators, and disaster recovery exercises. Requires working knowledge of MVS and program products, and good communication skills. Expertise in BAL, JCL, PROCS and system libraries required. Disaster recovery experience a plus.

ENGINEER HARDWARE/SOFTWARE
Requires good knowledge of hardware/software involving real time control and data communication systems. Should have assembly language, C and operating systems interface. Hardware familiarity with both 8 and 16 bit processors.

PROGRAMMER/ANALYST
Position requires minimum of 3 years DEC VAX hardware, RMS software experience. On-line systems exposure. COBOL experience required, along with several years programming and systems analysis.

DATA PROCESSING MANAGER
Experience with System 34 required. Large mainframe exposure helpful. Applications include financial and manufacturing (MAPICS); some programming experience on System 34 necessary. Prior supervisory experience required.

SR. PROGRAMMER ANALYST
Must have at least 3 years of BAL experience using IBM hardware in an OS environment. Heavy user contact.

SR. SYSTEMS ANALYST
Must have 3 years experience programming; COBOL, and/or SAS. ReadyCode, FOCUS, microcomputer familiarity a plus. Will support corporate users with programming and analysis on one-time planning and research oriented projects. Will be DP liaison of users in projects from microcomputer to 4th generation language applications.

SYSTEMS PROGRAMMER
At least 3 years experience using COBOL, TSO, OS/VS JCL and IBM utilities. CICS and/or data base and VSAM a plus. Will provide programming support and batch programming assignments within a Big Ticket Merchandising System and a Promotional Reporting System, with some on-line exposure. At least 2 years experience using VSAM.

PROGRAMMER ANALYST
At least 2 years experience COBOL, SPF, TSO, HIPO, OS/JCL. Will write programs specifications and code programs.

SYSTEMS PROGRAMMER
At least 2 years programming; COBOL, JCL, Utilities and independent "research" analyst for your own efforts. TSO, SPF required; Operations a plus. Will support and develop programs in Batch Credit. Possibly minimal travel.

SR. SYSTEMS PROGRAMMER
Experience with documentation and procedures in Software areas, proficient in BAL, and a working knowledge of MVS and related Software functions. Must be able to deal with all levels of management on a technical basis. Responsible for all systems software aspects of disaster recover at all IPC's.

SYSTEMS PROGRAMMER
Experience working on IBM PC Apple, micro hardware and communications, along with mainframe programming are a plus. Will serve as consultant in MicroComputer Center assisting users with problems as well as assist in hardware and software evaluation and give seminars to the user community on micro products.

SR. SYSTEMS PROGRAMMER
Responsible for all software preparation, maintenance and testing of Disaster Recovery procedures and documentation. Requires BS in Computer Science or equivalent, strong BAL, working knowledge of MVS and related software functions. Strong communication skills and extensive experience with software documentation and procedures essential.

MVS SYSTEMS SOFTWARE PROGRAMMER
Will be responsible for and must have experience in installation and maintenance of MVS JES3 and related program products. Strong BAL, MVS SMP, and I/O SYSGEN experience required

SR. PROGRAMMER ANALYST
Troubleshooter and programmer for production and enhancements with multiple user interface and large IMS data base. Four years experience using COBOL, TSO, OS/VS, JCL and IBM Utilities. IMS and CICS a plus. Initiative and problem solving skills a must. Bachelor's in Computer Science or equivalent preferred.

SYSTEMS SYSTEMS
Coordinate installation and modification of JES2 software on large scale IBMs in an MVS/SP shop moving towards MVS/XA Minimum 6 years senior MVS Systems programming experience, with 3 years involving JES2 internal code and IBM/MVS software experience essential. Some applications require knowledge of time sharing/decision support systems and integration of VAX technologies.

SR. SYSTEMS ANALYST – FINANCIAL SYSTEMS
Research, design, develop and support modifications in large system Sales Audit area. Two years each of programming, development and research experience with heavy user interface skills required. IMS or CICS knowledge preferred. TSO, SPF, COBOL, BAL, JCL programming skills required.

SR. PROGRAMMER ANALYST
Must have at least 3 years COBOL-COMMAND level CICS experience using IBM hardware in an OS environment. Heavy user contact.

PROJECT LEADER – HUMAN RESOURCES SYSTEMS
Lead, plan and organize the technical team in the design, development and installation of a large HR system. Your experience must include large system/IMS data base design, JCL, DL/1 and hands-on IBM IMS Utilities. CICS and previous experience in benefits, payroll and personnel applications a plus.

ASSOCIATE TECHNICAL SPECIALIST
At least 4 years IMS Application Programming and Technical Programming expertise in IMS and CICS and 2 years System Software Programming experience. Familiar with IBM software maintenance procedures and the reorganization of data bases including the creation of REORG-PROCS. ASSEMBLER & IBM DSRC Product helpful.

PROJECT LEADER
Direct and document team of programmer/analysts in development of MIS Financial/Credit systems based on user requirements. Requires programmer/analysts with 3-7 years experience using COBOL, BAL, JCL and IBM Utilities, plus 2 years as project leader Operations experience and knowledge of TPF, TSO, TOP-Secret, Panvalet, PAC II or PC70 desired.

SR. SYSTEMS ANALYSTS
Direct and develop "Top Secret" security data base and train personnel in its use. Requires knowledge of data security software, and minimum 3 years experience in systems analysis, design, programming, testing and debugging, plus TSO and SPF experience. Good communication and interpersonal skills necessary.

Please send me a CARI Candidate Profile Summary.

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UAI Technology, a Research Triangle Park based software development firm is seeking qualified computer programming and management personnel.

Positions are available at the analyst, senior analyst and group leader levels. The analyst position requires 1-3 years programming experience in FORTRAN. The senior analyst candidate will have 4 or more years experience in FORTRAN, and the group leader will have 6 years of total experience. The group leader will in addition to the requirements for senior analyst have management experience in coordinating software development and/or systems design work.

All positions require a B.S. or B.A. degree in CS/MIS/AM, TSO, JCL are helpful.

The salary and benefit packages of the companies are aggressively better than those of other companies.

UAI Technology, through its designers and computer models has more than 75% of the nation's largest 100 banks as clients, in areas of corporate banking management, financial accounting and investments.

The company has grown at a compound annual rate of more than 75% per year over the last five years. If you have your future in doing something and someone, send your resume to:

Pamela Johnson
Vice President
UAI Technology, Inc.
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FACULTY POSITIONS IN BUSINESS COMPUTER INFORMATION SYSTEMS

The Computer Information Systems Department invites applications for faculty positions available September 4, 1984. Many in Business problems and master's degrees with extensive business and training in computer systems analysis and programming is required. College teaching experience desirable. People in these areas in graduate preparation and ability to teach courses in several of the following areas: Systems Analysis, Programming Languages, Telecommunications, and Data Base Management. Rank and salary will be commensurate with training and experience. Salary range $20,000-$34,000 for 9 months employment. Send letter of application to:

Dr. Robert A. Thacker, Head, Computer Information Systems, Ferris State College, Big Rapids, MI 49307.

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Chicago Illinois 60606 (312) 977 1555

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Worthington Ohio 43085 (614) 846 9926

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Dallas Texas 75230 (214) 661 8600

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Englewood Colorado 80075 (303) 393-3600

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Hollywood Florida 33084 (305) 434-9112

HARTFORD, Commerce Inc
999 Asylum Avenue
Hartford Connecticut 06105 (203) 549-4240

HOUSTON, Computer Consultants Inc
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Houston Texas 77056 (713) 626 4100

LOUISVILLE, Computer Personnel Services Inc
107 S Pennsylvania
Indianapolis Indiana 46204 (317) 634-4715

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Bank Mutual Suite 230
Milwaukee Wisconsin 53202 (612) 238-9200

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Personnel Services
17141 Ventura Boulevard Suite 200
Encino California 91316 (213) 986-4400

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7332 West State Street Suite 3
Milwaukee Wisconsin 53213 (414) 475-0077

MINNEAPOLIS, Employers Systems Personnel
850 Twin City Federal Tower 121 S 8th St
Minneapolis Minnesota 55402 (612) 338-6716

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Madison New Jersey 07940 (201) 701-0400

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New York New York 10007 (212) 227 7370

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CPA Associates Personnel Inc
2530 James Street
Syracuse New York 13206 (315) 463-5225

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Greensboro North Carolina 27405
(919) 373-1481

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4625 North 17th Street Suite N101
Phoenix Arizona 85016 (602) 274-0866

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San Francisco California 94111 (415) 398-3535

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Bellevue Washington 98004 (206) 455 2700

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In this key position you will have the opportunity to manage both the Data Base Administration and Data Administration activities utilizing IBM's IMS DBMS. Supervising a staff of 10, you will also direct our migration to data base and provide leadership for data base projects. Strong communication skills and a proven track record with at least 4 years managing a data resource department is required. Banking or financial experience considered important.

SYSTEMS ARCHITECT

You will be responsible for establishing long-term information systems architectural goals and workable plans to meet the established objectives. You must be able to interact with development teams and provide design guidance. IMS DBMS design knowledge is desirable. A high level global view of financial systems is also important. Experience evaluating vendor application software is a plus.

INFORMATION SYSTEMS STRATEGIC PLANNER

In this high visibility position, you will develop a strategic information systems plan based on our corporate business plan. The self-motivated, results-oriented individual we seek must have financial industry experience with at least 2 years in information systems planning. Excellent communication and organizational skills are essential.

These positions offer personal, professional, and financial growth opportunities. We offer relocation assistance, excellent benefits, and a salary commensurate with experience. If you would like to be a part of our growing team of computer professionals, you should forward your resume including salary history in confidence to:

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Senior Programmer/Analyst

Small data processing shop is looking for top notch, career minded individual. Join a progressive, rapidly growing Louisville, Kentucky based firm.

Duties include the analysis, design, programming and testing of new and existing financial and management information systems.

Qualified candidates will have a minimum of five (5) years Cobol experience some of which will be on a mini computer using data base structures in on-line applications. HP3000 experience is a definite plus. Send resume and salary requirements to:

Chad Wilson
NTS Development Company
10172 Linn Station Road
Louisville, KY 40223

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Entre' Computer Centers, Inc., America's fastest growing franchisor of retail computer centers, is seeking a seasoned Data Processing professional with proven project management skills to lead the implementation of our sophisticated on-line distribution systems.

Your qualifications must include top notch organizational, leadership and interpersonal skills; an in-depth understanding of customer service, order processing, and inventory control systems; and a strong systems analysis and design background. An understanding of accounting concepts and systems and prior exposure to TANDEM computers would be definite pluses.

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Mr. Neil J. Cumiskey
Director, Information Services

1021 Kidwell Drive
Vienna, Va. 22180
(703) 556-0660

Sorry, no entry level positions are available at this time.

FACULTY POSITION

Allright College is continuing to invite applications for a new faculty position in Computer Science. Candidates must be qualified in two or more of the following areas: assembly and machine language, operating systems, data base theory, computer organization, theory of programming languages. Doctorate in computer science or a closely related area preferred, but masters degree will be considered, relevant professional or industrial experience desirable. Strong commitment to undergraduate teaching in a liberal arts college and excellent communication skills are mandatory.

Computer Science at Allright is an established major field of study based on ACM Curriculum '78 recommendations. The college curriculum includes a broad general studies program and emphasizes applied thinking and communicative skills.

Position available September 1984. Send resume by April 30 to: Mrs. Donna McClelland, Department of Mathematics and Computer Science, Allright College, P.O. Box 516, Reading, PA 19603.

Allright College is an Equal Opportunity/Affirmative Action Employer

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SYSTEMS PROGRAMMER

Needed by the UMR Campus Computer Center to install, maintain, and modify computer operating systems and utility programs and provide related technical assistance to computer center programming staff, faculty, and students. A Bachelor's degree in Computer Science or an equivalent combination of education and experience from which comparable knowledge and abilities can be acquired, plus 2-3 years programming experience with emphasis in Assembler language and of these one higher level programming language is required. In-depth knowledge of and systems programming experience on IBM 4341 systems, VM/VMS, and thorough knowledge of JCL and systems programming experience on OS/VS1 system is desired. Experience with Internal operating systems known and software systems using Telenet and IBM terminals and IBM software, including ISPF and compilers such as Cobol, Assembler, APL, CADAM, CAPOS, CATIA) is desired. Salary range: $18,239 - $22,068. Excellent fringe benefits, including Educational Assistance. Deadline for receipt of completed applications: April 15, 1984. For application form, contact: Personnel Services, 6-1 Parker Hall, University of Missouri-Rolla, Rolla, MO 65401, or call (314) 341-4811. UMR is an affirmative action/equal opportunity employer.

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Tenure track position, Northern Michigan University. Requirements: Ph.D. DBA. COBOL Systems Analysis Design, Data Base Management. Rank: Assistant Associate Professor. Salary: Competitive. Apply: Dr. Brian Gnauck, Head Department of Management, Northern Michigan University, Marquette, Michigan 49855. Northern Michigan University is an Equal Opportunity Affirmative Action Employer.

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Responsibilities will include evaluation of application design, architecture evaluation, capacity sizing, predicting systems performance, and performance tuning of multiple large-scale systems and/or complex of distributed 8100s.

Qualified applicants should forward a resume; including appropriate salary data to: Ms. Joanne Bintliff, **CIGNA Corporation**, 401 White Horse Road, Voorhees Township, NJ 08043. We are an Equal Opportunity Employer.

CIGNA

Sohio

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The successful candidates will work within a structured analysis and design project team environment to provide seismic systems development support for the Geophysical Research and Development staff at Sohio's Technology Data Center in Dallas.

Geophysical Systems Analyst

Requires expertise in using structured analysis and design techniques to analyze, design, specify and test state of the art seismic systems for Sohio's aggressive exploration programs.

Minimum 3 years' experience in seismic software development including time series analysis or geophysical signal processing is required.

Individuals should have above average skills in interpersonal relations, written and oral communication. Project management skills are also desirable.

Geophysical Data Base Analyst

Requires expertise in using structured analysis and design techniques to analyze, design, specify and test geophysical data base management systems for use with state of the art seismic interpretation systems.

BS or MS degree in computer science, math or related field is required. Minimum 3 years' training and experience in the analysis, design, specification and testing of software systems under a structured environment is required.

Individuals should have above average skills in interpersonal relations, written and oral communications. Project management skills are desirable.

All positions require familiarity with FORTRAN 77. Experience with DEC (VAX-11/750 & VAX 11/780) and CRAY IS/X-MP systems is desirable. DEC assembler, DEC systems internals, data base management systems, graphics software and hardware experience is preferred.

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Please forward your resume, in confidence, to: Employment Manager, OCLI, 2789 Northpoint Parkway, Santa Rosa, CA 95407-7397. Equal Opportunity Employment is our Pledge and Practice. U.S. Citizenship required.

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If you have 2 or more years' data processing experience in the technologies we utilize, you can apply by filling out the application below:

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Data Base Designers
- 8+ years' DP experience
- Strong DP Administration experience
- IMS DB/DC + VSAM
- IMS Debugging
- IMS Control Block Generation

Job #2

Telecommunications/Office Automation
- Data Network Design/Evaluation
- VTAM Systems Programming
- Mini-Micro Evaluation Technology
- LAN's, IBM/SNA
- Tandem Systems Programming: TAL, ENVOY, PATHWAY
- Network Quality Control/ Implementation

Job #3

IMS Programmer/Analyst
- IBM MVS/XA, TSO/SPF, VSAM
- IMS DB/DC On-line Development experience
- Structured Analysis & Design
- COBOL

Job #4

Large Scale Applications Development
- Structured Methodologies
- Structured ANS COBOL/ Structured Analysis/Design
- Cycle Sort/Bulk Filing/ Item Processing
- Data Base, Data Communications and Applications
- Check Sorter, Stock Transfer, and Demand Deposit experience
- Systems IBM/MVS/XA, TSO/SPF
- IBM Assembler Language Coding & Design experience

Job #5

Systems Programming
- Operating System Development: MVS/XA, VM/SP, VM/XA
- Systems Software Internals: IMS DB/DC-FASTPATH, JES3
- IMS utility design
- Assembler Language Programming
- Change Management Strategies
- VSAM Support

Job #6

Mini-Computer Operations/ Software Implementation
- Knowledge/Experience with DEC & Tandem HW/SW and Operating Systems
- Analytical Skills
- NIM, VPS, TIS, VHB
- IMS Externals, VM, MVS Externals/Internals, IMS FASTPATH
- Assembler Programming, Software Design & Development
- Technical Writing Skills
- Teleprocessing Systems Software, Utilizing Products like ACF VTAM, ACF/NCP, BTAM, NCCF and NPDA
- HW-IBM 3081, 3033, 370, 360
- SW-IMS-DB/DC, ADF, BTS, MVS/XA
- Languages-COBOL, IBM Assembler
- Assess/Resolve Problems Quickly

Job #7

Also available: IMS Systems Programming; VTAM/NCP Systems Programming for Los Angeles Area. **Job #8.**

Capacity Planning/ Performance Tuning
- Hardware capacity planning for IMS, VM, MVS environments
- Critical application tuning
- Measurement/Modeling: BEST1, SAS, CAPTURE/MVS, RMF/SMF, VMAP, SMART, IMS monitors

Job #9

Financial Planning & Control
- 5-7 years' finance and planning experience
- MBA in accounting/finance desirable
- Understanding of financial reporting and trend analysis

Job #10

ACP/TPF Programmers/ Analysts
- VM/CMS development techniques
- Assembler/Sabretalk
- Operators, coverage programmers (locations in Los Angeles and San Francisco)

Job #11

End User Computing
- IBM PC, WANG, NOMAD, MARK IV, RAMIS, FOCUS VM/VPCSS
- Knowledge of: equipment acquisition and installation procedures
- Requirements analysis and research, specification design, problem resolution and teaching experience.
- Excellent interpersonal and client interface skills

Job #12

Systems Writer
- Will research, write and edit text
- Will prepare or direct the preparation of graphics
- Coordinate reviews and prepare publication specifications as well as arrange for printing
- English degree with at least two years' technical writing experience

Job #13

Operations Manager
- Provide structure, liaison and direction to all operational activities
- Responsible through the matrixed organization to ensure that the user's service level needs are met
- Telecommunications management experience
- Capability to deal with senior management and effectively influence decisions

Job #14

Project Manager
- Effectively manage a technical support organization responsible for the creation and maintenance of production procedures and associated documentation for all applications executed
- Minimum of 3 years' DP management experience
- Extensive technical experience in computer operations or applications programming

Job #15

Systems Analyst & Sr. Systems Analyst
- Provide written procedures for operations to provide first level problem analysis and recovery
- Shift flexibility needed
- Experience with computer operations, job execution, software implementation
- Good written and verbal communications skills
- Provide recovery for commonly occurring failures
- Senior position requires above plus 5-10 years' experience

Job #16

Systems Consultant
- Major responsibility will be change implementation, planning & tracking
- Strong background in Data Communication hardware/ software Architectures and operations in a large network environment

Job #17

IMS Systems Programming
- Systems Development and Support: IMS DB/DC, FASTPATH, MSC
- Systems Software Development: Automated Debugging, Automated Operator Interface, Recovery and Restart Aids
- Application Utility Development, Data Base Randomizers, Space Management Tools, Application Front Ends.

Job #18

At Bank of America, we offer salaries commensurate with experience and ability, and a comprehensive benefits package including relocation assistance. To respond, we invite you to call, send in our mini-application, or send resume outlining position of interest, job number, and salary history to: Bank of America, Dept. 3228-0326A, 1455 Market Street, San Francisco, CA 94103. An equal opportunity employer, m/f/h/v.

Bank of America NT&SA

Name _____ Phone: Home _____ Other _____

Address _____

Hardware background _____ Software background _____

Languages: Primary _____ Secondary _____ Other _____

Current/Last position _____ Company _____ Salary Requirements _____

Are you applying for a specific position? If so, please designate job # and position _____

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Senior Data Base Analyst

If you'd like to work in an achievement-oriented environment where the spirit of innovation is thriving...

Make it happen with Harris

Harris, Florida's largest industrial employer, is a Fortune 200 corporation, with sales of $1.9 billion. And the Semiconductor Sector alone, accounts for $300 million in annual sales. In fact, we are one of the twelve largest suppliers of integrated circuits in the United States.

At Harris, we've always believed that the best way to develop cutting-edge, innovative products is to encourage, recognize and reward individual achievement. And we'll continue to do just that, by providing an environment which fosters both versatility and unlimited growth potential.

To support the growth of the entire Semiconductor Sector, we're seeking a Senior Data Base Analyst. In this key position, you'll design physical data bases to implement the logical design in support of informations systems development and operations plans. Responsibilities will also include: insuring the integrity, availability, and efficient performance of division data bases; assisting in capacity planning; and providing training for users of data base software.

To qualify for this outstanding opportunity, you should be proficient in physical data base design, IDMS compilers and utilities, IDMS operation and internals, IDMS data dictionary capabilities and operation, TSO/SPF, OS/MVS JCL, COBOL and BAL programming languages. In addition, you should have a working knowledge of Culinet development and productivity tools, as well on personal computer data base software and OS/MVS operating system concepts.

A BS and 4 years' IDMS data base experience is required. A Masters degree is preferred.

Harris Semiconductor offers an excellent compensation/benefits package, a formal merit review program and the opportunity to work in beautiful Melbourne, Florida. Located on Florida's high-tech Space Coast, Melbourne offers you and your family a delightful year-round climate, affordable housing and a variety of recreation.

For immediate consideration, **please call Dick Langher COLLECT at 305-724-7413**, between the hours of 8 am - 5 pm, EST. Or send your resume to his attention at Harris Semiconductor, Dept.CW14, P.O. Box 883, Melbourne, Florida 32901.

We are an equal opportunity employer M/F/H/V.

HARRIS

IF IT'S HAPPENING IN ELECTRONICS, IT'S HAPPENING AT HARRIS.

Growth Opportunities For Data Processing Professionals

Holiday Inns, Inc. is shaping the future of the hospitality industry. Due to our continued success, we have on-going and immediate needs for dynamic professionals in the following areas:

ACP/TPF

Senior ACP Programmer—Must have minimum 5 years of system and programming development experience with large scale teleprocessing systems oriented toward the solution of business problems, of which no less than 3 years should be in an ACP environment.

SYSTEMS DEVELOPMENT

Programmer Analysts—3-5 years experience including systems analysis; proficiency in COBOL and either Data Base or CICS applications. TI-990 experience desired.

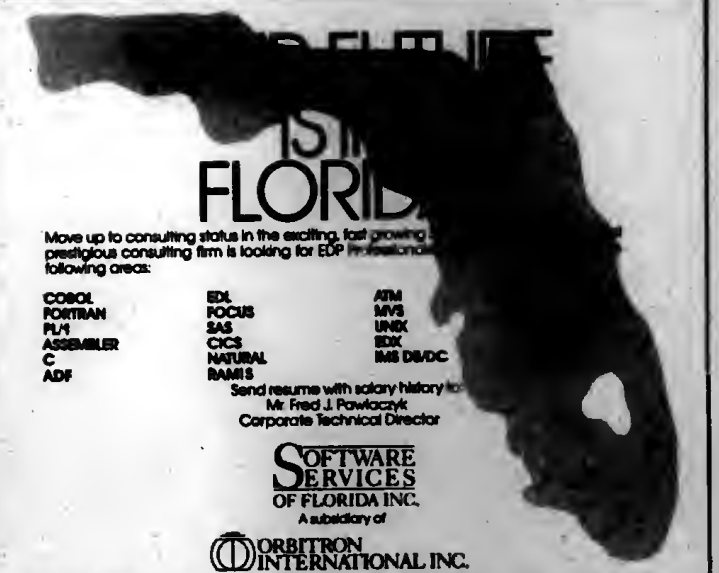
Senior Programmer Analyst—Minimum of 5 years experience including systems analysis, system design, COBOL, CICS and Data Base applications; and project leadership. Previous experience in a payroll/personnel environment a definite plus.

Both positions require knowledge of IBM mainframes, OS JCL and TSO/SPF.

The Memphis area affords a moderate cost-of-living, mild but seasonal climate and a vast array of cultural and recreational activities. Our worldwide headquarters provides a working environment conducive to personal and professional growth and achievement.

We offer excellent compensation, competitive employee benefit packages and an educational assistance plan. If qualified and interested, send your resume in strict confidence to: HOLIDAY INNS, INC. - Recruiting and Selection/JG, 3796 Lamar Avenue, Memphis, TN 38195.

Holiday Inn



Move up to consulting status in the exciting, fast growing ... prestigious consulting firm is looking for EDP Professionals ... following areas:

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FORTRAN	FOCUS	MVS
PL/1	SAS	UNIX
ASSEMBLER	CICS	IDIX
C	NATURAL	IMS DB/DC
ADF	RAMIS	

Send resume with salary history to:
Mr Fred J. Powlaczyk
Corporate Technical Director

SOFTWARE SERVICES OF FLORIDA INC.
A subsidiary of
ORBITRON INTERNATIONAL INC.

PARAGON CROSSING SUITE 124 11300 4TH STREET NORTH ST. PETERSBURG, FLORIDA 33704 (813) 577-1475

SYSTEMS ANALYST COMPUTER PROGRAMMER ANALYST FOR STUDENT RECORD/ REGISTRATION SYSTEMS

Selected candidates will participate in the implementation and maintenance of an on-line student information system. Must be skilled in the preparation of specifications for programmers and user offices, be able to perform structured and procedural analysis, coordinate resource requirements, and participate in the development of plans and schedules.

Technical experience with IMS DB/DC, DB/DC, JCL, COBOL, EASYTRIEVE and PANVALET preferred.

Bachelor's Degree with Business and/or Computer Science emphasis.

Benefits include the waivers for college courses, tuition promotion policy, generous vacation and holiday schedules, insurance and retirement.

Send resume to:
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EMPLOYMENT SERVICES
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KNOXVILLE, TN 37996
UTK is an EEO/Affirmative Action/Title IX/Section 504 Employer.
Deadline for applications 1 May 1984.

DP BANK OPPORTUNITIES

$25-40,000

Numerous Southeast banks offer challenging career opportunities for Data Processing Professionals with ATM, BRANCH AUTOMATION, PRODUCT DEVELOPMENT, REGIONAL AND NATIONAL BANKING, and other banking experience, i.e., TRUST, EDA, CONSUMER AND RETAIL. These clients are state-of-the-art IBM, S/38 DB/DC, CICS, users with a variety of product development aids. To inquire confidentially about these and other positions available, send resume to Larry Stone or call (704) 375-0800.

FOX-MORRIS
212 S. Tryon St./Suite 1300
Charlotte, NC 28281

SYSTEMS ANALYST/ PROGRAMMER

Assists the Hopi Tribe in planned implementation of automated systems from startup to full, work operation. Incumbent's time is initially spent in systems analysis work requiring user training and education and involves major systems design. Qualifications must be equivalent to the use of a major programming language and possess 5 years of major computer systems analysis and programming experience.

Northeastern Arizona is semi-arid. High desert with warm summers and mild winters. Tribal headquarters are close to the Grand Canyon, Canyon de Chelly, the Painted Desert and other beautiful geologic formations. The area is rich in native culture, history and archeology.

Compensation depends upon experience and includes excellent housing provided at low rent. Applicants with ability to adapt to challenging positions, requiring patience, mobility and a genuine interest in both teaching and learning in a unique rural environment should send a resume and references to:

THE HOPI TRIBE
Personnel Department
P.O. Box 123
Kykotsmovi, Arizona
86039

THE UNIVERSITY OF ASTON IN BIRMINGHAM

Computer Centre

Lectureships in Computing and Information Technology.

As a result of continued developments in Computer Science and Information Technology generally, we are seeking to attract young people of exceptional promise for a small number of new appointments. The successful candidates will be required to undertake research and to contribute to the Centre's Teaching Programme.

Ideal candidates would have a higher degree preferably in Computer Science and special experience in either:

(a) Database and Information Systems
(b) Computer Architectures or
(c) Intelligent Knowledge-based Systems

Initial salary will be within and up to the maximum of the range £7,100 to £14,125 per annum. Appointments will commence as soon as possible and will be made for a fixed-term of three years initially with the possibility of renewal or subsequent transfer to a continuing appointment.

Application forms and further particulars may be obtained from the staff officer (Quoting ref:584/244), University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET England (Tel: 21 359 3611 ext. 4884).

Closing date for the receipt of applications is April 27, 1984.

FACULTY POSITIONS WESTARK COMMUNITY COLLEGE

Full time faculty positions are available which will start on June 4, 1984 and also on August 24, 1984. Bachelor's degree required, Master's preferred in Business Data Processing, Computer Science or related field. Competitive salaries offered with liberal benefits available. To apply, write or call: Director of Personnel/EEO, Westark Community College, P.O. Box 3649, Ft. Smith, AR 72913. AC 501-785-4241. Equal Opportunity Employer.

DIRECTOR COMPUTER SERVICES

Two-year community college, located at the foot of the Big Horn Mountains, is accepting applications for Director of Computer Services. Responsible for all Academic (Hardy 1000) and Administrative (Microtek 1600) computer systems within the college. Bachelor's degree (Master's preferred) in computer science, information systems or related area. Computer center/services management experience. Direct inquiries to: Personnel Office, Sheridan College, Sheridan, Wyoming, 82801. Application deadline: April 30, 1984. An Equal Opportunity Employer.

RESEARCH ASSISTANT/ SOFTWARE DEVELOPER

Responsible for analysis, requirements specifications, design, implementation, test, documentation, maintenance and management of large software systems. Apply existing software engineering techniques into the development of large software system. Conduct of software systems in the following computer languages: ADA, Basic, Cobol, Fortran, Pascal and Assembler. Knowledge of compiler construction, ADA programming, VAX 11/780, Apple IIe. Master's degree in Computer Science. $17,100 per annum. 40 hr/wk. Send resume to Georgia Department of Labor, Job Service Center, 1 Peachtree Street, Atlanta, GA 30303. Control Number 0481403.

COLLEGE OF THE VIRGIN ISLANDS

Instructor, Assistant or Associate Professor of Data Processing (non-tenure track). Ph.D. in information science, computer science or related fields desirable. Master's degree in information systems and teaching experience acceptable. Industry experience desirable. Must be qualified to teach at least two of the following: COBOL, and/or RPG programming, systems analysis and design, information systems and applications, computer architecture, computer languages, operating systems, or computer maintenance. Salary commensurate with qualifications: $20,730 to $28,185 plus benefits. Submission of application, resumes and three letters of recommendation by March 31, to: Chairperson, Business Administration Division, College of the Virgin Islands, St. Thomas, VI 00802. Equal Opportunity/Affirmative Action Employer.

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Cleveland is the nation's best kept secret. Anyone who has lived here knows it is a city with much to offer. Four beautiful seasons, parks and bountiful recreation facilities, plus cultural activities including the symphony, ballet, opera and live theatre. Our midwestern lifestyle offers friendly neighborhoods at affordable prices.

Leaseway Transportation has been headquartered in Cleveland since it was founded, over 80 years ago. With revenues of over $1.3 billion, Leaseway stands out as a major employer with outstanding career opportunities, especially for systems professionals.

Our new data center is equipped with an IBM 3083BX/4341 complex running under OS/MVS and a dual processor Sperry 1100/72 system. Distributed systems include Prime, HP and Four-Phase. Extensive use is made of database architecture in systems design with development work performed on-line and supported by a fourth generation language.

If you are degreed and have broad business and systems project experience, Leaseway wants to hear from you. IBM and transportation industry knowledge are preferred. Expansion of our corporate capabilities has created the need for:

* SR. PROGRAMMER/ANALYSTS
* SR. SYSTEMS ANALYSTS

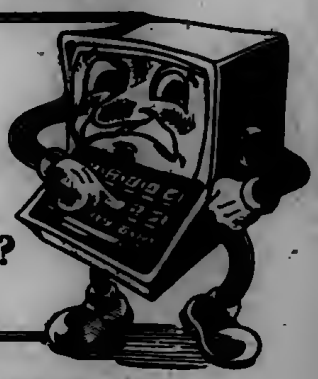
Please send your resume and salary requirements to Debra Miller at:

Leaseway Transportation
3700 Park East Drive
Cleveland, OH 44122

An Equal Opportunity Employer M/F

SYSTEMS PROGRAMMERS

Do you feel "terminally ill" in your present position?



If all you do all day is "talk" to machines, maybe it's time to make a change. . .to cga

Cure your problem with an exciting new career at CGA. If you're comfortable working with people and enjoy the challenge of systems software development, please read on.

CGA Software Products Group is one of the largest systems software companies in the U.S. We're dedicated to the development and support of state-of-the-art systems software products.

Work directly with our clients in product support and assist them with any problems or questions that may arise. A minimum of 2 years experience with MVS BCP internals is essential as is good communications skills and the ability to deal professionally with people of all levels. Knowledge of multiple CPU related software, preferably MSI, MSM or GCD would be a major asset. Some travel to SHARE, CMG and GUIDE meetings is also necessary.

You will find that being a member of our team is highly rewarding. We offer a superior salary and benefits package including profit sharing, major medical/life/health/dental insurance, tuition reimbursement, and relocation assistance.

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$30,000-$65,000+

The coast-to-coast Fox-Morris recruitment network has placed thousands of hi-tech executives in key positions with leading companies during more than two decades. Client companies pay all employment expenses. A few examples of choice 1984 opportunities include:

SR. COMPUTER SW DESIGNER to $50K. Degree. Solid bkgd in peripheral sys & interfaces for DEC equip. POSITION LH-4-1-C

ADABAS SYSTEMS MGR. to $50K. IBM internals & op syst dvlpmt for progressive telecommun fdr. POSITION JC-4-2-C

MGR. DATA BASE, $45K+. DBA to initiate data base & train staff & users in DB concepts. Fortune 100 div. Mid-Atl. POSITION HG-4-3-C

SYSTEMS DESIGN, $35-45K. Analyze large-scale real-time computer H/W & S/W environ. Develop new concepts tech for leading edge mfg architectures. POSITION AT-4-1-C

DATA BASE ADMINISTRATOR to $42K. Design/implement IMS DB/DC system for large Mid-Atl financial institution. POSITION JC-4-1-C

BUSINESS SYSTEMS CONSULTANT, $40K. Budget planning, inventory control, distribution & order processing. Strong user interface skills. POSITION LS-4-1-C

INFO SYSTEMS AUDITOR to $40K. Major growth corp /DC area. Help pace new system dvlpmt & emerging technologies. POSITION GN-4-1-C

SOFTWARE ENGR. to $40K. S/W designer to support product dvlpmt. Work w C" Pascal. Assembler language. Need microprocessor 68000 & 8086/Z80. POSITION AT-4-2-C

ROBOTICS SOFTWARE DEVELOPER to $40K. BSEE or CS w/3+ yrs real-time control exp. UNIX ^C 68000 HW or SW bkgd. POSITION LH-4-2-C

OP SYSTEM & COMPILERS, $30K. Software engrs to design new operating systems & compilers using assembler. Growth co. POSITION HG-4-2-C

FORTRAN OR PL-1 to $30K. Banking systems software co expansion. Need programmer/analysts w/strong technical skills. POSITION HG-4-1-C

BUSINESS SYSTEMS ANALYST. Sales/mktg systems exp. Know COBOL. On-line systems design/implementation. POSITION LS-4-2-C

For direct, confidential access to our national client network, call or send resume to Karyn Davis at our Fox-Morris corporate headquarters:

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COMPUTER CENTER DIRECTOR
DENISON UNIVERSITY

Position open July 1, 1984 or as soon thereafter as possible. Responsible for planning and directing overall activity of the college computer center in providing instructional and administrative computer services to a liberal arts college. Ultimate responsibility for design of physical computer systems, distributed to wand processing, information processing architecture includes distributed processing and networking of all information facilities over next few years.

Seek person with supervisory experience in networking, minicomputers, data processing, including data based management and applications design.

Reports to Provost. Letter of application, resume, transcripts and list of references by April 23, 1984 to Dr. Louis F. Rabinowitz, Provost, Denison University, Granville, OH 43023.

Denison is an Equal Opportunity/Affirmative Action Employer.

CAD/CAM engineer

FMC Corporation's Central Engineering Laboratories is a multidiscipline research center chartered to provide technical services and identify new product opportunities for the construction, defense, food, material handling and petroleum business of FMC.

We are seeking a Mechanical Engineer familiar with CAD/CAM systems who wants to become part of our corporate CAD/CAM support group. This position will be responsible for installing and maintaining CAD/CAM software and providing user training and guidance on the application of software. Additional responsibilities will include providing support with problem resolution by fault isolation and correction; determining, specifying and implementing enhancements and extensions.

This position requires a BSME or equivalent and 2-3 years FORTRAN programming experience. An understanding of engineering applications for CAD and CAM, knowledge of VAX/VMS systems, and the ability to work with large FORTRAN programs is also required.

We offer an excellent salary and benefit package as well as challenging project assignments. For confidential consideration, submit resume or call: Ms. V. Payne, (408) 289-3433, FMC Corporation, Central Engineering Laboratories, 1185 Coleman Avenue, Santa Clara, CA 95052. We are an equal opportunity employer m/f.

FMC

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Technical Marketing Support

APPLICATIONS SPECIALISTS

TALON COMPUTERS, INC.

Talon Computers, a rapidly emerging computer manufacturer, is seeking highly motivated individuals who possess the rare combination of technical expertise and customer relations skills. As a member of our matrix marketing team, you will be responsible for pre-sales support, technical presentations and internal/external systems training.

Opportunities are currently available in the following areas:

COMMERCIAL DATA PROCESSING
Office Automation
Accounting
MIS
Word Processing

DATA-ORIENTED
AI
Pattern Recognition
Data Analysis
Database Mgmt. Systems

AUTOMATION & CONTROL
ATE
Robotics
IEE Standards
Factory Automation

COMMUNICATIONS
Networking
Front-end Processors
Line Switching Equipment

ENGINEERING & SCIENTIFIC
CAD
Energy Logging
Flight Simulation

To qualify, you must have a minimum of 4 years experience in software and hardware applications in one or more of the above disciplines and at least 1 year's experience in customer support (ideally with large OEM accounts). Extensive travel will be required. Appropriate educational background a must. UNIX* background will be considered a plus.

*UNIX is a trademark of ATT Bell Laboratories

Talon offers an outstanding total compensation package as well as an exceptional organizational environment to demonstrate your skills. Interested individuals are invited to submit their resumes and salary requirements in confidence, to: Rick Sdao, Personnel Manager

TALON COMPUTERS, INC.

525 Julie Rivers Road, Suite 190
Sugar Land, Texas 77478/713-240-4040

/ An equal opportunity employer M/F

DATA PROCESSING OPPORTUNITIES

Our client is a growing $240,000,000 manufacturer that is the dominant force in its industry with both domestic and foreign operations.

Does your education and experience qualify you for the position of...

--SYSTEMS & PROGRAMMING MANAGER
--SENIOR PROGRAMMER ANALYST

Are you experienced in large scale systems, distributive processing and state-of-the-art Honeywell hardware?

Would you be attracted by a thriving community with excellent schools, outdoor recreation, many cultural outlets and continuing educational opportunities?

In addition to a competitive salary and base benefit programs, this client offers profit sharing programs, stock ownership programs, educational assistance and an excellent relocation package.

If this sounds like the opportunity you've been hoping for, send a complete resume, including salary history to:

Ron Stoll
RON STOLL & ASSOCIATES
420 S. Fourth St.
Elkhart, IN 46516

If you would prefer to talk to me about these positions, call COLLECT:

(219) 522-2366 - (M/F 8AM-5PM)
or
(219) 293-4073 - (Weekends)
An Equal Opportunity Employer M/F

CICS PROGRAMMERS & ANALYSTS

We have several opportunities in the Carolinas for Programmers and Analysts experienced in CICS in either the OS or DOS environment. Our client companies include small and large end-users, located in both urban and rural areas. A minimum of one year of professional experience is required. Knowledge of DL/1 is a definite plus.

For additional information regarding these opportunities, call Mr. Lee Martin:

(804) 460-3668 or
Forward Resume to:

Fortune
Personnel Consultants
of Virginia Beach
510 South Independence Blvd.
Virginia Beach, VA 23452

PENSACOLA JUNIOR COLLEGE
SYSTEMS PROGRAMMER
DUAL B6800 SHOP

Minimum qualifications: Graduation from an accredited four year college or university and three years of progressively responsible experience in Senior Systems analysis and programming work; majority must have been in systems programming. Progressively responsible experience as described above may be substituted on a year for year basis for the required education. Prefer familiarity with a large scale Burroughs Computer and experience with DCALGOL, NDL II, MCP, Disk/tape applications including DMALOG, SYSTEM 2000, BMF II, CANDE, GEMCOS. Salary range $27,141 - $36,388. Application deadline: May 2, 1984. Position number 3448. Request for an official application should be sent to: Douglas Duncan, Director of Personnel, Pensacola Junior College, 1000 College Blvd., Pensacola, FL 32504.

PJC - An Equal Opportunity Institution

COMPUTER SYSTEMS MANAGER

LAVALCO, an innovative energy hardware wholesaler and marketing company seeks a results-oriented individual to direct and maintain business operations on an IBM and Honeywell System. The ideal candidate will be an established MIS professional with 3-5 years PACE operating and programming experience in business data management. Responsibilities include supervising all aspects of EDP operations, assisting maintenance of financial, inventory, sales and other systems, order entry, invoicing and other general business applications along with necessary systems support. The individual must combine management, technical and communications skills and be self-motivated. We offer a competitive salary and fringe benefits. Please send resume with salary history in confidence to:

Personnel
LAVALCO
P.O. Box 5804
Shreveport, LA 71135-5804

FLORIDA

PROGRAMMERS
30 New Positions

We are starting a major development project for an industry leader where you will have an opportunity to realize full potential of your creative abilities. You will be trained in the latest data base & data communication languages. If you have 3+ yrs. of COBOL in an OS/MVS environment, call:

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We Serve Computer Professionals
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SR. PROG./ ANALYST

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111 Pearl St.
Hartford, CT 01603
(203) 278-7170
Personnel Consultants

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- Faculty positions available August 1984, to teach FORTRAN, COBOL, RPG, BASIC, or Computer Operations. Baccalaureate Degree required, preferably in Computer Science or Business. Send letter of application, resume and names, addresses, and telephone numbers of three professional references to:

Personnel Services (SB),
Williamsport Area Community College, 1005 West Third Street, Williamsport, PA 17701.
EOE/AA

REAL-TIME SOFTWARE ENGINEERS

TANO CORPORATION, a leader in the design and manufacture of computer-based automation control systems, seeks career-oriented individuals to fill immediate openings.

SR SYSTEMS/SYSTEMS SPECIALISTS
ADA PROGRAMMERS

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Candidates must have a Master's degree in a relevant engineering field, or a Bachelor's degree in a relevant engineering field plus equivalent experience. Also the candidate must have recent experience with the particular hardware and software systems outlined above, as well as teaching experience using this system. The University of Florida is an equal opportunity, affirmative action employer.

Nominations or resumes should be directed to Dr. M.J. Chrones, Chairman, Search Committee, Department of Engineering, University of Florida, Gainesville, FL 32611.

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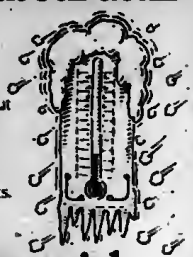

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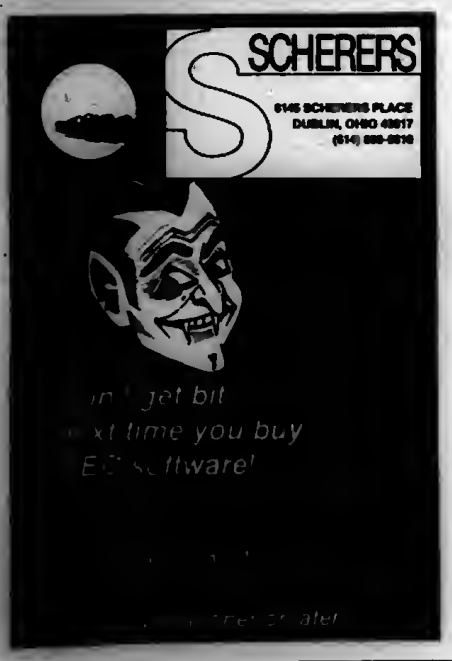

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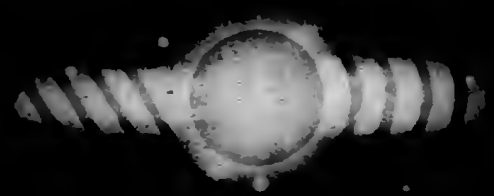

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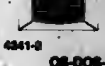

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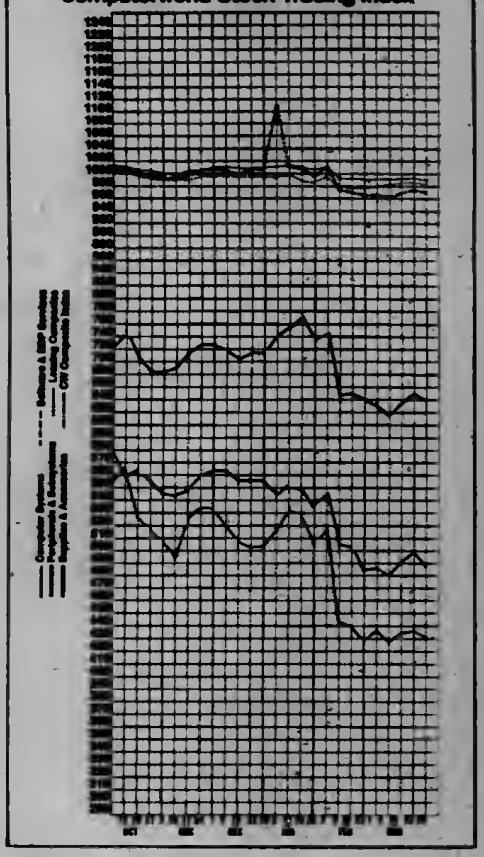

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	1983-84 HIGH	1983-84 LOW	CLOSE	NET CHANGE	WEEK AGO	WEEK HIGH	WEEK LOW	NET CHANGE	PCT CHANGE
COMPUTER SYSTEMS									
ALPHA MICROSYSTEMS	11- 25	10	10	- 1/8	-1.2				
ALTOS COMPUTER SYST	9- 38	11 1/4	9 3/4	- 3/4	-8.1				
AMDAHL CORP	50- 84	34 1/2	50	+ 3/4	+20.4				
APPLE COMPUTER INC	18- 63	23 3/8	23	- 1/2	-1.0				
ATARI	20- 39	19 1/4	19	- 1/4	-1.2				
BURROUGHS CORP	35- 58	38 3/8	38	+ 1/8	+0.3				
COMPUTER AUTOMATION	8- 13	7 3/4	7	- 1/4	-3.1				
COMPUTER CONSOLES	7- 20	10 7/8	10	- 1/8	-0.7				
CONTROL DATA CORP	24- 33	28 1/4	28	+ 3/4	+2.6				
CONVERGENT TECHNOL	14- 61	49 1/2	49	- 3/8	-0.8				
CRAY RESEARCH INC	29- 98	82 3/4	82	+2 3/4	+8.4				
DATA GENERAL CORP	19- 54	46 1/8	46	- 1/8	-1.0				
DATAPOINT CORP	11- 30	25 1/4	25	+1 1/4	+5.2				
DIGITAL EQUIPMENT	62-130	97 1/4	97	- 1/4	-0.2				
ECCO INC	8- 16	14 3/4	14	- 1/4	-1.6				
ELECTRONIC ASSOC.	9- 15	9 7/8	9	- 1/8	-0.1				
FLOATING POINT SYST	12- 29	19 1/4	19	- 1/4	-0.1				
FONDORO	23- 67	30 3/4	30	- 1/2	-1.6				
GENERAL AUTOMATION	3- 10	10 3/4	10	- 1/4	-2.3				
GRID INC	29- 44	39 3/8	39	- 3/8	-0.9				
HARRIS CORP	29- 61	39 1/8	39	+ 1/2	+1.3				
HEWLETT-PACKARD CO	27- 94	89 7/8	89	- 1/2	-0.5				
HONEYWELL INC	29- 88	87	87	+1	+1.7				
IBM	97-129	127 3/8	127	+ 7/8	+0.6				
IPL SYSTEMS INC	4- 14	4 3/4	4		0.0				
ISC CDC INC	13- 30	15 1/2	15		0.0				
MASSTOR COMP SYSTS	1- 9	3 1/2	3		0.0				
MANAGEMENT ASSIST	7- 26	23	23	- 3/8	-0.8				
MATHEMATICS ELECTRON	47- 84	81	81	+4 3/4	+6.2				
MICROLAB COMPUTER SYS	9- 19	8 3/4	8	- 1/2	-5.3				
MICRONET DATA SYS	10- 19	19	19	- 1/2	-2.7				
MOTOROLA INC	62-130	112 3/8	112	+2	+1.8				
NAT'L SEMICONDUCTOR	13- 60	14 3/8	14	+ 3/8	+2.8				
NBI INC	10- 31	27 7/8	27	+ 1/8	+0.4				
NCR	39-138	133	133	- 1/2	-0.4				
PERKIN-ELMER	13- 37	37 3/8	37	- 1/4	-0.6				
PRIME COMPUTER INC	19- 37	37 1/2	37	+1 1/4	+3.4				
SPERRY CORP	31- 58	49	49	- 1/2	-1.1				
TANDEM COMPUTERS INC	14- 56	31 1/8	31	-2 1/4	-6.8				
TANDY CORP	19- 41	39 3/4	39	+2 1/4	+6.0				
TELEVIDEO SYSTEMS	11- 41	9 1/2	9		0.0				
TELOS CORP	0- 6	0 3/4	0	- 1/4	-25.7				
TEXAS INSTRUMENTS	74-130	130	130	+6 3/8	+5.0				
ULTIMATE CORP	9- 24	19 3/4	19	- 1/4	-1.2				
VECTOR GRAPHICS INC	2- 24	3 3/4	3	- 1/8	-3.2				
WANG LABS "B"	13- 70	37	37	-1 3/4	-4.5				
WANG LABS "C"	13- 70	37 1/2	37	-1 1/2	-3.8				
XEROX CORP	39- 93	62 1/4	62	+1 1/8	+1.7				
LEASING COMPANIES									
BOOTHE FINANCIAL CP	11- 40	36 1/2	40	+1	+2.6				
CIMARRON CORP	7- 42	19 1/2	19	- 3/4	-3.7				
CONTINENTAL INFO SYS	3- 19	3	3	- 1/8	-3.4				
DPF INC	3- 18	17 3/4	17	- 1/4	-1.4				
SELECTRAN INC	13- 21	19 1/4	0		0.0				
U.S. LEASING	18- 47	38 3/8	38	-1 1/8	-2.8				
COMPONENTS									
ADVANCED MICRO DEV	12- 37	29 5/8	29	- 1/8	-0.4				
ADV D SEMICONDUCTOR	12- 38	23	23	-1	-4.2				
ANALOG DEVICES INC	16- 42	31 3/8	31	- 1/2	-1.6				
ANALOGIC CORP	16- 27	15 3/4	15	- 1/4	-1.7				
APPLIED MAGNETICS CP	19- 37	15 1/4	15	- 1/4	-1.6				
TERADYNE	16- 38	29 1/4	29	+ 1/4	+0.8				

	1983-84 HIGH	1983-84 LOW	CLOSE	NET CHANGE	WEEK AGO	WEEK HIGH	WEEK LOW	NET CHANGE	PCT CHANGE
SOFTWARE & EDP SERVICES									
ADVANCED COMP TECH	1- 8	6	6	- 1/4	-7.8				
ADVANCED SYSTEMS INC	7- 22	17 3/4	17	+1 1/4	+6.7				
ADR COMPUTING INC	7- 33	29 1/2	29	-1 1/4	-4.1				
APPLICON SOFTWARE	14- 56	47	47	- 1/2	-1.0				
AUSCOMP INC	6- 22	6 1/4	6	- 1/4	+10.5				
AUTOMATED SYS. CORP	9- 36	8 1/4	8	- 3/8	-4.7				
AUTOMATED DATA SYS.	9- 27	23 3/4	23	- 1/4	-1.0				
BGR COMPUTER SYSTEMS	3- 15	6 1/2	6	- 1/4	-3.8				
BOTTOMLINE COMP LTD	1- 3	1	1		0.0				
CAM COMPUTER ASSOC.	9- 17	13 1/8	13	- 1/8	-1.2				
COMPUTER ASSOC. INTL	29- 38	36 1/2	36	+ 1/2	+1.4				
COMPUTER HORIZONS	9- 28	13 1/4	13	+1 1/2	+12.7				
COMPUTER NETWORK	7- 11	8	8	- 1/4	-3.0				
COMPUTER SCIENCES	11- 22	17	17	- 1/8	-0.1				
COMPUTER TASK GROUP	9- 22	13 1/2	13	- 1/2	-3.6				
COMPUTER LEASE	9- 22	11 1/4	11	- 1/4	+10.0				
COMPUTONE SYSTEMS	9- 36	9	9	- 1/4	-2.7				
CONDRY CORP	9- 20	9 1/2	9		0.0				
CONSULAR	7- 14	9 1/8	9	- 1/8	-1.3				
DALLMEY SOFTWARE	28- 39	39 1/2	39	+1 1/2	+3.9				
CYCARE SYSTEMS INC	9- 27	10 3/4	10		0.0				
ELECTRONIC DATA SYST	18- 40	39 3/4	39		+1.3				
HUMAN SYSTEMS INC	9- 27	19 3/4	19	- 3/4	-3.8				
GENERAL ELECTRIC CO	39- 54	54 3/8	54	+1 3/8	+2.6				
ICC CORP	19- 54	39 1/2	39	- 3/8	-0.1				
INFORMATICS INC	29- 54	39 1/2	39	- 1/2	+0.6				
INFORMATION SYSTEMS CO	9- 18	17 1/2	17	- 1/2	+2.8				
KEANE ASSOCIATES	4- 18	7 1/4	7	- 1/4	-3.3				
LOGICON	21- 54	39 1/2	39	- 3/8	-0.9				
MAI COMMUNICATIONS	9- 20	9 7/8	9		0.0				
MANT RET ASSN INC	9- 20	19 1/2	19	- 1/2	-2.5				
METHODICS APP GRP	9- 20	17 1/2	17		0.0				
MICRO SYSTEMS INC	23- 32	30	30		+1.0				
MICRO-HARD CP	9- 22	11 1/4	11	+1 3/4	+17.8				
NATIONAL DATA CORP	9- 28	27 1/4	27	- 3/8	-1.4				
ON-LINE SOFTWARE INT	9- 27	9	9	- 1	-11.1				
PARAMETRIC SYSTEMS	9- 31	17 1/2	17	+1 1/2	+9.0				
PLANNING RESEARCH	9- 24	18 3/4	18	+1 1/4	+7.7				
POLICY MGMT SYSTS CP	19- 36	39	39	-1 1/4	-3.0				
PERKINSMORE & SYS	7- 9	9 3/4	9	- 1/4	-2.6				
TECHNOLOGY DEVELS	17- 35	24	24	-1 3/4	-6.8				
TELCOM CORP	9- 17	17	17	-1 1/4	-6.8				
TRANSD NATIONAL SYST	19- 33	32 1/2	32	-1 3/8	-4.1				
SCIENTIFIC COMPUTERS	9- 14	9 1/4	9		0.0				
SOFTWARE AG	9- 17	12 3/4	12	- 3/8	+0.6				
TYMSHARE INC	12- 30	25 3/8	25	- 1/8	-0.5				
UCC CORP	9- 18	18	18	- 3/8	-2.0				
UNIV CORP	7- 17	10 1/8	10	+1 1/4	+12.0				
PERIPHERALS & SUBSYSTEMS									
DA INTERNATIONAL	9- 7	3 1/8	3	-	-1.6				
ANDERSON JACOBSON	7- 25	6 7/8	6	- 1/4	+3.8				
AUTO-TROL TECHNOLOGY	9- 23	19 1/8	19	- 1/2	-2.6				
DANCTEC INC	9- 23	19 1/8	19	- 1/8	+0.4				
DENTVE INT'L	9- 18	9 1/4	9	- 1/8	-1.6				
DIGITAL STORAGE & SYS	9- 36	19 1/4	19	- 1/4	-6.7				
DIGITAL COMP	1- 4	3 3/8	3		0.0				
ELECTRONICS DATA COMP	9- 20	16	16	- 1/4	+1.1				
ELTEC CORP	9- 20	7	7 1/8	- 1/8	-1.8				
EMULTRONICS	7- 25	6	7 1/8	- 1/8	-1.8				

	1983-84 HIGH	1983-84 LOW	CLOSE	NET CHANGE	WEEK AGO	WEEK HIGH	WEEK LOW	NET CHANGE	PCT CHANGE
COMPUTER DEVICES INC	1- 23		7/8	- 1/8	+16.6				
COMPUTER TRANSCEIVER	3- 12	3 1/4	3	- 1/8	-3.1				
COMPUTERVISION CORP	19- 57	39 7/8	39	-1 1/8	-2.1				
CONRAC CORP	14- 38	15	15	-1 1/4	-7.8				
DATAPRODUCTS CORP	19- 31	23 1/2	23	+2 1/8	+8.0				
DATARAM CORP	5- 10	9 3/4	9	- 1/4	+2.6				
DATA BOSTON CORP	10- 41	16	16	-2	+10.0				
3BTRN INC	3- 12	7 7/8	7	- 1/8	-2.4				
DECISION 3000 COMPUT	7- 18	10 1/2	10	+1 3/8	+15.0				
DOCUTEL-OLIVETTI	9- 30	9 7/8	9	- 7/8	-8.1				
ELECTRONIC M S M	9- 20	9 1/4	9	- 1/4	-2.6				
EMBIN. INC	9- 34	13 1/2	13	- 1/2	-3.6				
EVANS & SUTHERLAND	17- 38	17 1/4	17	-2 1/4	-11.5				
FARADAY TECHNOLOGIES	1- 2	1	1		0.0				
GENL DATA COMM INC	9- 30	28 1/8	28	+1	+3.6				
HOUSTON INSTRUMENT	9- 20	9	9		0.0				
HAZELTINE CORP	7- 31	30 7/8	30	- 7/8	-2.8				
ICOT CORP	3- 16	3 1/2	3	- 3/8	-9.8				
INFORMATRON INTL INC	10- 21	12 3/8	12	- 1/8	-0.8				
INFORMATION SCIENCE	9- 11	9 3/4	9	+ 1/8	+0.6				
INTEL CORP	9- 31	29 3/4	29	- 1/8	-0.4				
IPL SYSTEMS INC	4- 14	4 3/4	4		0.0				
LUNDY ELECTRONICS	3- 19	9 1/2	9	- 1/2	-5.1				
MEGADATA CORP	3- 19	9 1/2	9	- 1/2	-5.1				
MSI DATA CORP	10- 30	19 3/4	19		0.0				
NORMAN CORP	9- 27	19 3/4	19	+1 3/4	+9.8				
NETWORK SYSTEMS CORP	9- 30	29 3/4	29	+1 3/4	+6.2				
OA AMERICOM PHILIPA	47- 38	35 7/8	35	- 1/8	+1.3				
SOUTHERN TELECOM LTD	23- 29	29	29	-2 1/4	-9.3				
SMEA	9- 36	9 1/4	9	- 1/4	-2.6				
PARADYNE CORP	13- 50	40 3/8	40	- 1/8	-1.0				
PENRIL CORP	9- 20	9	9	- 1/4	-2.6				
PHENIX AMERICAN INA	7- 17	9 1/2	9	- 1/4	-2.6				
PLESSEY SY (ADR)	29- 51	39 1/4	39	- 3/8	+1.1				
POINTWISE INC	9- 20	9 1/4	9	- 1/4	-2.7				
QANTEX CORP	9- 33	9 1/2	9	- 1/4	-2.6				
RAYTHEON CO	39- 39	39 1/2	39	- 7/8	-2.2				
RECOGNITION EQUIP	9- 17	12 3/4	12	+1 3/4	+15.0				
RELA CORP	9- 20	9 1/4	9	- 1/4	-2.6				
SANDERS ASSOCIATES	30-120	37	37	-2	-5.1				
SCAN DATA	1- 3	3/8	0		0.0				
SCAN-TRON CORP	9- 20	14	14	- 1/4	-1.7				
SCIENTIFIC ATLANTA	19- 32	19 1/2	19	- 3/8	-0.8				
SYDNEY TECHNOLOGIES	9- 17	11 1/2	11	- 1/4	+10.0				
SYNEC SYSTEMS INC	3- 17	9 1/2	9	- 1/4	-2.6				
SYSTEMS & COMP TECH	29- 38	29 1/2	29	- 1/4	-0.8				
T ADS INC	9- 24	9 1/4	9	- 3/8	-3.9				
TMC PRODUCTS CO	9- 24	23 1/2	23	- 1/4	-1.0				
TYCOM CORP	13- 30	19 3/4	19	- 1/4	-0.3				
TEC INC	9- 20	9 7/8	9		0.0				
TENTRONIX INC	29- 67	59 1/4	59	+6 1/4	+7.3				
TELEX	9- 35	21 3/4	21	- 1/4	-1.0				
TERMINAL SYSTEMS CP	9- 17	9 1/2	9	- 3/8	-3.8				
TIMEPLEX INA	7- 22	9	9	- 1/2	-5.1				
UNIVAL TECHNOLOGY	9- 28	24 1/4	24	- 1/4	-1.0				
SUPPLIES & ACCESSORIES									
AMERICAN BUS FORMS	7- 23	19 7/8	19	- 3/8	-1.8				
BARRY WRIGHT	12- 33	29	29	-2	-7.4				
BURLER PRODUCTS INC	12- 27	23 3/8	23	- 1/8	-0.5				
DATA GEN. FORMS	9- 28	19 1/2	19	- 1/4	-1.3				
3M COMPANY	49- 76	74 1/2	74	- 1/2	-0.6				
WANG COMP LTD	39- 91	39 1/2	39	- 3/4	-1.9				
STANDARD REGISTER	11- 39	39 3/4	39	- 3/4	-1.9				
WALLACE BUS FORMS	11- 39	39	39	- 1/4	-0.6				

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